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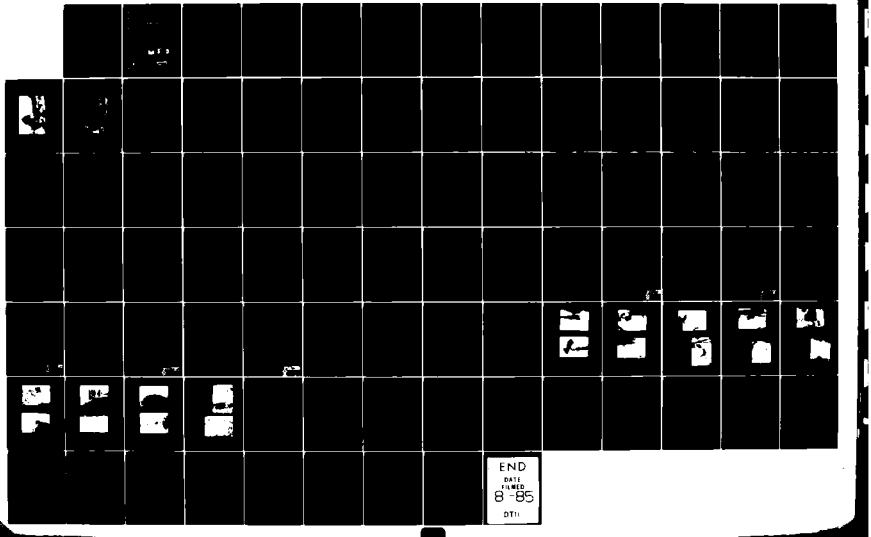

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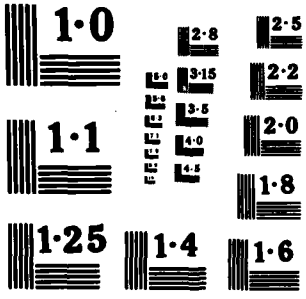
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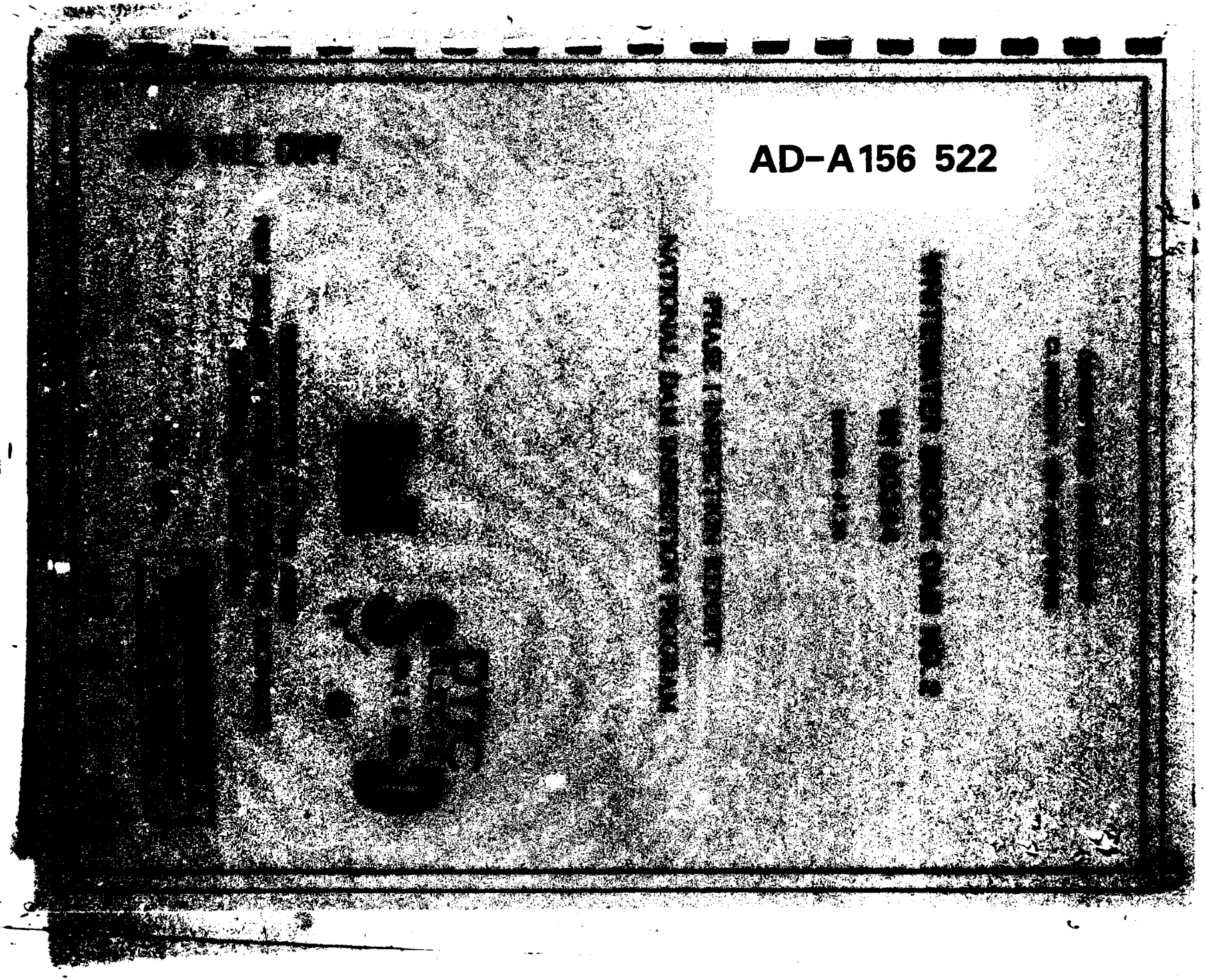
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Cover program reads: Phase I Inspection Report, National Dam Inspection Program; however, the official title of the program is: National Program for Inspection of Non-Federal Dams; use cover date for date of report.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

DAMS, INSPECTION, DAM SAFETY,
Connecticut River Basin,
Claremont New Hampshire,
Whitewater Brook.

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The dam is an earth embankment dam with a concrete side channel spillway. The maximum height of the dam is 95 ft. and it is about 425 ft. long. The dam is considered to be in good condition. The rock embankments protection on both slopes has deteriorated. It is intermediate in sieze witha high hazard potential. Vegetation should be removed from the dam embankment. Also a program of regular maintenance should be established.

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DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02154

REPLY TO
ATTENTION OF:
NEDED

JUN 25 1979

Honorable Hugh J. Gallen
Governor of the State of New Hampshire
State House
Concord, New Hampshire 03301

Dear Governor Gallen:

I am forwarding to you a copy of the Whitewater Brook Dam No. 2 Phase I Inspection Report, which was prepared under the National Program for Inspection of Non-Federal Dams. This report is presented for your use and is based upon a visual inspection, a review of the past performance and a brief hydrological study of the dam. A brief assessment is included at the beginning of the report. I have approved the report and support the findings and recommendations described in Section 7 and ask that you keep me informed of the actions taken to implement them. This follow-up action is a vitally important part of this program.

A copy of this report has been forwarded to the Water Resources Board, the cooperating agency for the State of New Hampshire. In addition, a copy of the report has also been furnished the owner, the City of Claremont, Water Department, City Hall, Claremont, New Hampshire 03743, ATTN: Mr. William E. Blaisdell, Superintendent.

Copies of this report will be made available to the public, upon request, by this office under the Freedom of Information Act. In the case of this report the release date will be thirty days from the date of this letter.

I wish to take this opportunity to thank you and the Water Resources Board for your cooperation in carrying out this program.

Sincerely yours,

JOHN P. CHANDLER
Colonel, Corps of Engineers
Division Engineer

Incl
As stated

WHITEWATER BROOK DAM NO. 2

NH 00344

NHWRB 47.30

CONNECTICUT RIVER BASIN

CLAREMONT, NEW HAMPSHIRE

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT

Identification No.:	NH 00344
Name of Dam:	Whitewater Brook Dam No. 2
Town:	Claremont
County & State:	Sullivan, New Hampshire
Stream:	Whitewater Brook
Date of Inspection:	June 7, 1978

BRIEF ASSESSMENT

Whitewater Brook Dam No. 2 is an earth dam with a concrete side-channel spillway. Top of dam elevation is 975.0 and spillway crest elevation is 967.0. It is located about 4 miles north of the City of Claremont, and it is being used for water supply. The dam has a maximum height of 95 feet and is approximately 425 feet long. The spillway is located at the east end of the dam.

Based on visual inspection and available records, the dam is considered to be in good condition. The rock embankment protection on both slopes has deteriorated. In places on the upstream slope, the embankment protection is barely adequate to protect the slopes. Continuance of this classification depends on proper operations and maintenance of the dam.

This dam falls under the category of high hazard potential, and it is intermediate in size. The test flood peak inflow is equal to the Probable Maximum Flood, 9,667 cfs, and the test flood peak outflow is 9,358 cfs obtained as a result of routing the test flood through the reservoir. Hydraulic analysis indicates that the maximum surcharge pool elevation will be 974.3, approximately 0.7 feet below the top of the dam. The project will pass the test flood peak outflow without overtopping the dam, and therefore the spillway capacity is adequate.

The following recommended operation and maintenance measures, as stated in Section 7.3, should be implemented within two years after receipt of this report by the owner:

1. Vegetation should be removed from the dam embankment.

2. The barely adequate slope protection in places on the upstream slope should be repaired. A program should be prepared and initiated to repair the rest of the slope protection as it becomes necessary.

3. Upstream embankment slope should be inspected at low water.

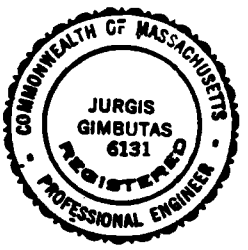
4. Remove all debris and overhanging trees from the downstream channel.

5. A program of regular maintenance should be established.

6. A program of technical bi-annual periodic inspection of the project features should be prepared and initiated.

7. A plan for surveillance and a warning system should be developed for periods of unusually heavy rains and runoff.

FAY, SPOFFORD & THORNDIKE, INC.
By



Jurgis Gimbutas, P.E.
Project Engineer

Richard W. Albrecht, P.E.
Vice President

This Phase I Inspection Report on Whitewater Brook Dam No. 2 has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgment and practice, and is hereby submitted for approval.

Charles G. Tiersch

CHARLES G. TIERSCH, Chairman
Chief, Foundation and Materials Branch
Engineering Division

Fred J. Ravens Jr.

FRED J. RAVENS, Jr., Member
Chief, Design Branch
Engineering Division

Saul Cooper

SAUL COOPER, Member
Chief, Water Control Branch
Engineering Division

APPROVAL RECOMMENDED:

Joe B. Fryar

JOE B. FRYAR
Chief, Engineering Division

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test Flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonable possible storm runoff), or fraction thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition, and the downstream damage potential.

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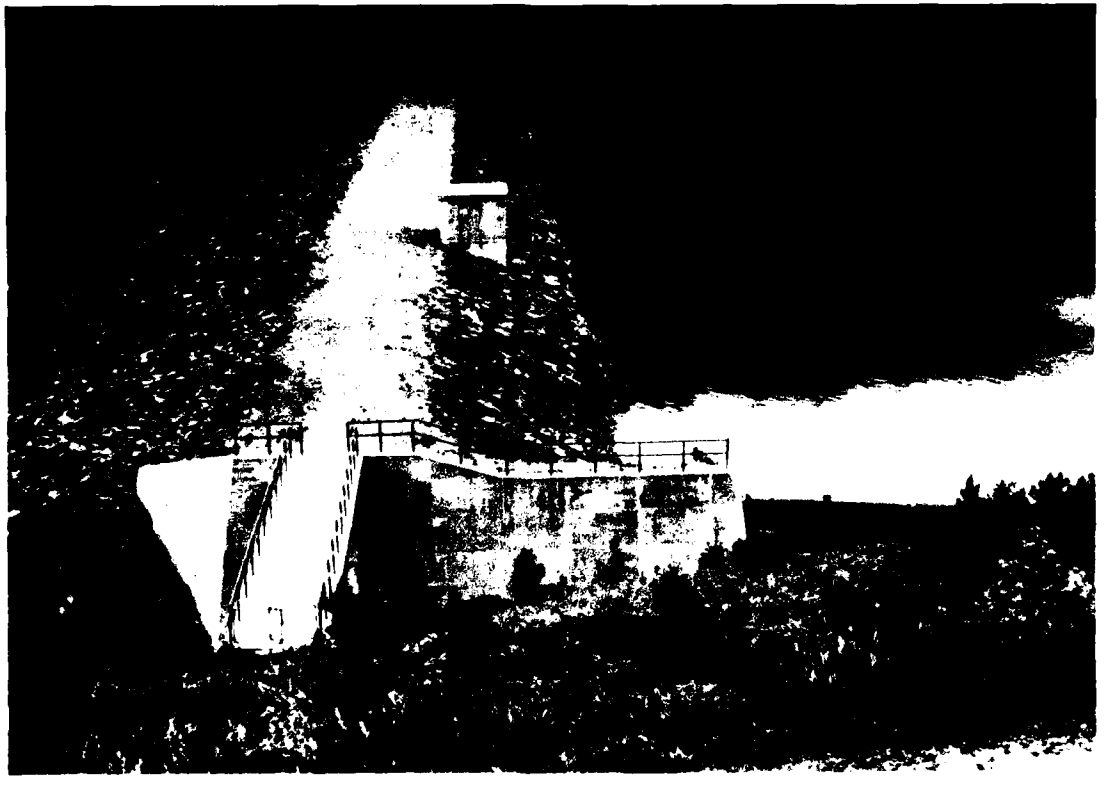
OVERVIEW PHOTOGRAPH



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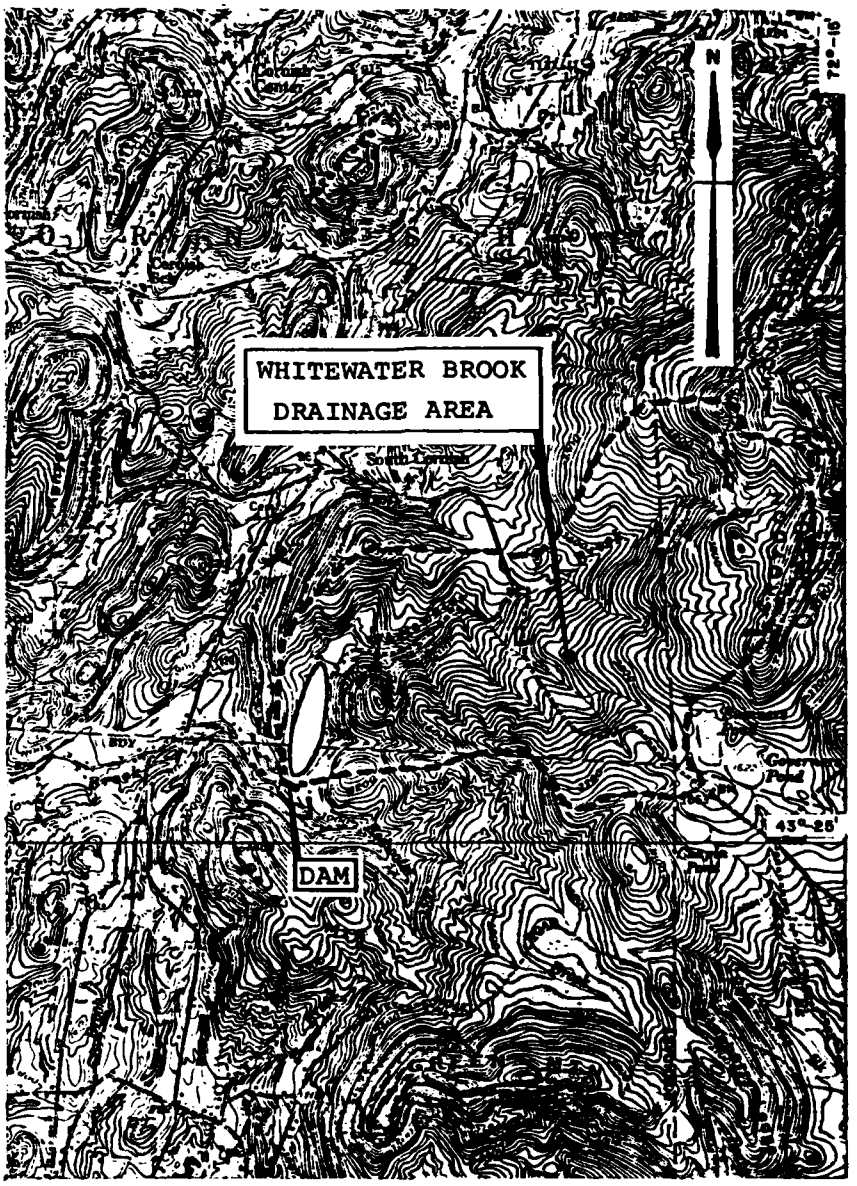

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UNITED STATES
DEPARTMENT OF INTERIOR
GEOLOGICAL SURVEY

NEW HAMPSHIRE
CLAREMONT QUADRANGLE 1957
AMS 6570 IV-SERIES V712

WHITEWATER BROOK DAM NO. 2

SECTION 1 - PROJECT INFORMATION

1.1 General

a. Authority

Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a National Program of Dam Inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. Fay, Spofford & Thorndike, Inc., have been retained by the New England Division to inspect and report on selected dams in the State of New Hampshire. Authorization and notice to proceed was issued to Fay, Spofford & Thorndike, Inc., under a letter of May 3, 1978, from Mr. Ralph T. Garver, Colonel, Corps of Engineers. Contract No. DACW33-78-C-0308 has been assigned by the Corps of Engineers for this work.

b. Purpose

(1) Perform technical inspection and evaluation of non-Federal dams to identify conditions which threaten the public safety and thus permit correction in a timely manner by non-Federal interests.

(2) Encourage and prepare the states to initiate quickly effective dam safety programs for non-federal dams.

(3) To update, verify, and complete the National Inventory of Dams.

1.2 Description of Project

a. Location

Whitewater Brook Dam No. 2, or the Lower Dam, is located in the southwestern part of New Hampshire, approximately one mile east of State Route 120 and about four miles north of Claremont, New Hampshire. This dam is situated on the southern tip of an artificial reservoir on Whitewater Brook, about 1000 feet upstream of its confluence with Redwater Brook, which is a tributary to the Sugar and Connecticut

Rivers. The dam is located within the boundary of the city of Claremont, the reservoir straddles this boundary, and most of it is located within the Township of Cornish.

To the north of this dam, which was constructed in 1967-1968, there is a smaller dam on Whitewater Brook, which is called Whitewater Brook Dam No. 1, or the Upper Dam.

b. Description of Dam

The dam consists of an earth filled embankment oriented approximately east-west, and a concrete spillway running south-north, at the east end of the dam. The concrete spillway is 120 feet long, dowelled into bedrock, 5 feet in height on the upstream side, and 8 to 22 feet on the downstream side. It is a side-channel, ogee-shaped and uncontrolled spillway. There is a 12-foot wide spillway chute cut into bedrock. It is approximately 700 feet long, including a 150-foot long stilling basin where it joins the Whitewater Brook stream bed. This dam is founded on both bedrock and soil. The embankment is up to 95 feet in height, with a crest length of about 425 feet. The upstream face of the embankment is 1 vertical to 3 horizontal, and downstream face is 1 vertical to 2.5 horizontal (Phogoraphs No. 1 and 2, Appendix C). Near the middle of the embankment there is a gate house which controls the flow out of the reservoir.

The crest elevations of the spillway and the embankment are 967.0 and 975.0, respectively.

c. Size Classification

The height of this dam is 95 feet, which falls in the range 40 feet 100 feet. On the basis of Table 1, Size Classification, in the "Recommended Guidelines for Safety Inspection of Dams," furnished by the Corps of Engineers, the dam is classified as intermediate in size.

d. Hazard Classification

In the event of failure of this dam, the city of Claremont, which is at a distance of about four miles downstream of the dam, will be in danger of being flooded. The depth of the water at the damage impact area, as shown in Appendix D, is estimated. It is also estimated that in the event of failure of this dam, loss of more than a few lives and excessive property damage would probably occur. Therefore, on the basis of Table 2, Hazard Potential Classification, in the "Recommended Guidelines for Safety Inspection of Dams," furnished by the Corps of Engineers, this dam falls in the category of high hazard potential.

e. Ownership

Since this dam was built, the owner has been the city of Claremont.

f. Operator

Mr. William E. Blaisdell, Superintendent of the Water Department, City Hall, Claremont, New Hampshire, telephone 603-542-6691.

g. Purpose of the Dam

Since its construction in 1967-1968, this dam has been used for water supply to the city of Claremont.

h. Design and Construction History

On January 22, 1965, Mr. George C. Benway, City Manager of Claremont, filed a Statement of Intent to construct and repair dams across Whitewater Brook. The intention was to repair the spillway of the existing Whitewater Brook Dam No. 1 within the Town of Cornish, and to construct a new Whitewater Brook Dam No. 2 about 1000 feet upstream of Redwater Brook, which is located within the boundaries of the city of Claremont. This Statement of Intent was granted by the New Hampshire Water Resources Board on March 17, 1965, and signed by Mr. Walter G. White, Chairman.

Contract plans and specifications were prepared by Fenton G. Keyes Associates, Architect-Engineers, Providence, Rhode Island. This project was identified as Whitewater Brook Dam No. 2, Project No. WS-1-30-0011. The set of drawings consists of 22 sheets, all dated October, 1966. On March 22, 1968, two sheets, Nos. 11 of 22 and 12 of 22, were re-issued to show a revised location and section of the spillway weir and the retaining wall.

The firm of Haley & Aldrich, Inc., Cambridge, Massachusetts, was engaged as soil consultants during construction. The construction began in June, 1967, and was completed in August, 1968. The general contractor was Warner Bros., Inc., Sunderland, Massachusetts.

i. Normal Operational Procedure

This dam is checked daily by either Mr. William E. Blaisdell, Superintendent of the Water Department, or by personnel designated by him. The flow through the outlet conduits is controlled by three manually operated gate valves located in the gate house. The gate valve located at Elevation 930 controls the flow through a 12-inch pipe. The flow through the 16-inch pipe is controlled by the

gate valve at Elevation 910. The gate valve located at Elevation 892 controls the flow through a 48-inch pipe.

The gate valve controlling the flow through the 48-inch pipe is probably never used. This is due to the fact that at the outlet structure, approximately 200 feet downstream of the center of the dam, the 48-inch conduit terminates. At this point two cast iron pipelines are connected to the 48-inch conduit, one 14-inch pipe drain and the other 16-inch water main.

1.3 Pertinent Data

a. Drainage Area

Whitewater Reservoir is artificially created by the construction of Whitewater Brook Dam No. 2. This dam is across Whitewater Brook and is about four miles north of Claremont, New Hampshire. The drainage area of Whitewater Brook at the dam is 4.2 square miles. The watershed area is heavily wooded and of mountainous topography.

b. Discharge at Dam Site

(1) Outlet works (conduits): Three conduits - 12- and 16-inch diameter cast-iron pipes, and a 48-inch diameter prestressed concrete cylinder pipe controlled by three separate gate valves at different levels.

(a) 12 inches in diameter and an invert elevation of 930.0.
14 cfs at Maximum Pool Elevation 974.3
13 cfs at Normal Pool Elevation 967.00

(b) 16 inches in diameter and an invert elevation of 910.00
29.0 cfs at Maximum Pool Elevation 974.3
27.0 cfs at Normal Pool Elevation 967.00

(c) 48 inches in diameter and an invert elevation of 892.0

The gate valve controlling the flow into the gate house through the 48-inch pipe is probably never used. At the outlet structure, approximately 200 feet downstream of the center of the dam, the 48-inch conduit terminates. At this point, two cast-iron pipelines are connected to the 48-inch conduit; one 14-inch drain pipe

extends to the outlet channel and the other 16-inch water main terminates at the next dam downstream.

(2) Maximum known flood at the dam site is the flood of May, 1972. The magnitude of the flood is unknown.

(3) The ungated spillway capacity at top of dam is 10,861 cfs at 975.0 elevation (msl).

(4) The ungated spillway capacity at test flood maximum pool elevation is 9,358 cfs at 974.3 elevation (msl).

(5) Spillway capacity is 3,840 cfs at Elevation 971.0.

c. Elevation (Feet above MSL)

(1) Top dam - 975.0.

(2) Test flood maximum pool elevation is 974.3.

(3) Full flood control pool - not applicable.

(4) Recreation pool - not applicable.

(5) Spillway crest (ungated) - 967.0.

(6) Stream bed at centerline of dam - 881.0.

(7) Maximum tail water - 885 (estimated).

(8) Design surcharge (original design, if known) - 971.0.

d. Reservoir

(1) Length of maximum pool - 4500 feet (estimated).

(2) Length of recreation pool - 3500 feet (estimated).

(3) Length of flood control pool - 4000 feet (estimated).

e. Storage (Acre-Feet)

The following values have been taken from the capacity curve furnished by Fenton G. Keyes Associates:

(1) Top of dam - 665.0 acre-feet.

(2) Test flood pool elevation - 650.0 acre-feet.

(3) Flood control pool - not applicable.

(4) Water reservoir at spillway crest elevation - 525 acre-feet.

f. Reservoir Surface (Acres)

The following values have been taken from area-elevation curve furnished by Fenton G. Keyes Associates.

(1) Top of dam - 20 acres.

(2) Test flood maximum pool elevation - 18.8 acres.

(3) Flood control pool - not applicable.

(4) Recreation pool - not applicable.

(5) Spillway crest - 17.5 acres.

g. Dam

(1)	Type	Earth fill dam
(2)	Length	425 feet
(3)	Height	95 feet
(4)	Top width	20 feet
(5)	Side slopes	
	(a) Upstream	1 vertical to 3 horizontal
	(b) Downstream	1 vertical to 2.5 horizontal
(6)	Zoning	Modified homongeneous type of dam consisting of impervious material
(7)	Impervious core	None
(8)	Cutoff	Upstream of center of the dam
(9)	Grout curtain	Cutoff trench

h. Spillway

(1)	Type	Ungated (ogee-shaped) concrete weir
(2)	Length of weir	120 feet
(3)	Crest elevation	967.0 msl
(4)	Gates	None
(5)	U/S channel	Reservoir

i. Regulating Outlet

(1) 48-inch prestressed concrete cylinder pipe

(a)	Invert	882.0 msl, downstream; 897.0 msl, upstream
(b)	Control mechanism	Gate valve, manually operated

(2) 16-inch cast-iron pipe

(a)	Invert	910.0 msl
(b)	Control mechanism	Gate valve, manually operated

(3) 12-inch cast-iron pipe

(a)	Invert	930.0 msl
(b)	Control mechanism	Gate valve, manually operated

SECTION 2 - ENGINEERING DATA

2.1 Design

Drawings indicating plans, elevations, profiles, and sections of the dam, appurtenant structures and outlet works were obtained from Fenton G. Keyes Associates. Selected drawings are included in Appendix B. These drawings also include the logs of borings, the treatment of the foundation of the dam, and the area and capacity curves. These curves are included in Appendix B, see Drawing Sheet 2 of 22.

2.2 Construction

a. Concrete Properties

The source, type of aggregate, cement used, mix design data and the result of testing during construction was not available from project records. Available records indicate that Mr. John N. Isham was resident during construction and that a representative from Fenton G. Keyes Associates inspected the project during construction. Therefore, it is the writer's opinion that tests were performed and specified concrete properties were obtained during construction. Design drawing, Sheet 16 of 22, specifies that all concrete is to have 3000 psi compressive strength in 28 days.

b. Construction History

(1) Diversion Scheme

Available reports indicate that the contractor diverted the water of Whitewater Brook through the 48-inch prestressed concrete cylinder pipe during construction of the embankment. This information is contained in the construction report filed at the City Hall in Claremont, New Hampshire.

(2) Construction Sequence

Prior to the construction of the embankment, the contractor started or completed the following items:

(a) clearing and stripping the reservoir area;

(b) constructing the cutoff trench;

(c) grouting;

(d) constructing a 48-inch prestressed concrete cylinder pipe;

(e) constructing the spillway;

(f) diverting the water of Whitewater Brook through the 48-inch prestressed concrete cylinder pipe.

(3) Pertinent Construction Problems

Available reports indicate that the project was behind schedule due to the absence of rock at the indicated elevations in the core trench. This resulted in additional dewatering and the grouting operation proceeded slower than expected. This information is contained in the construction report filed at the City Hall in Claremont, New Hampshire.

c. Testing

Construction control test data are not available from project records. Since there was a resident engineer present during construction, it is assumed that these tests were performed.

2.3 Operation

The flow through the outlet conduits is controlled by 3 manually operated gate valves located in the gate house.

No engineering operational data such as programs, plans of surveillance were disclosed.

2.4 Evaluation

a. Availability

Pertinent structural, geotechnical, hydrologic, and hydraulic data, which formed the basis of the design of the dam, are available from the project records.

b. Adequacy

Sufficient engineering data are available for a Phase I inspection.

c. Validity

The available data is considered valid on the basis of the results of the visual inspection.

SECTION 3 - VISUAL INSPECTION

3.1 Findings

a. General

The Phase I inspection of Whitewater Brook Dam No. 2 was performed on June 7, 1978. A copy of the inspection check list is included in Appendix A.

In general, the soil and rock features are in good condition. The concrete spillway structure of this dam has been observed to be in good condition, see subparagraph c.

b. Dam

No evidence of vertical or horizontal misalignment was observed nor was there any evidence of seepage or piping. The rock slope protection on the upstream slope is generally in poor to fair condition, and the downstream slope is in fair condition. The rock slope protection on both slopes has deteriorated. In places on the upstream slope, the slope protection is barely adequate to protect the slopes. The gravel roadway on the crest is in good condition, and there is no indication of sloughing, bulging, or movement of the slope (Photographs No. 14, 15, and 16, Appendix C).

Vegetation, consisting of weeds and grass, was noted on both the upstream and downstream slopes and on top of the dam (Photographs No. 11 and 12, Appendix C).

c. Appurtenant Structures

At the time of our inspection, the water level of the reservoir was at Elevation 967.04, and therefore we could not visually inspect the intake channel and the intake structure at Elevation 897 msl. The condition of the 48-inch conduit, a prestressed concrete cylinder pipe that is located under the dam, could not be observed due to the fact that the upstream side was underwater and the downstream side buried. Due to the fact that the outlet structure was buried, approximately 3 feet, it could not be visually inspected.

The concrete of the visible parts of the spillway, gate house, footbridge, and the east abutment is in good condition. According to the operator, all gates are in operable condition. Joint

alignment is generally good, and no erosion or cavitation was noted. Patches of the concrete were observed on the downstream face of the spillway. The footbridge was constructed using both precast and cast-in-place concrete. The railing of the bridge, consisting of 1 1/2-inch pipe, was observed to be in good condition (Photographs No. 3, 4, 7, 8, and 13, Appendix C).

d. Reservoir Area

Whitewater Reservoir is artificially created by the construction of an embankment dam across Whitewater Brook. The reservoir is surrounded by mountains and dense forest (Photographs No. 1 and 10, Appendix C).

e. Downstream Channel

(1) Outlet Channel

Available plans indicate that at the outlet structure, approximately 200 feet downstream of the center of the dam, two cast-iron pipelines are connected to the 48-inch conduit where it terminates. One 14-inch drain pipe extends to the outlet channel and the other 16-inch water main terminates at the next dam downstream. The inspection team could not find the 14-inch drain outlet or the outlet channel.

(2) Spillway Chute

The channel and existing cut slopes are in good condition. A small rock slide was observed in the channel at approximately the center of the spillway. This slide is minor in nature and will not significantly impede the flow in the channel. Debris, minor in nature, was observed at the top of the spillway and in the channel (Photographs No. 5, 6, 17, and 18, Appendix C).

3.2 Evaluation

The observed condition of the dam is good. No potential problems were observed during the visual inspection except for the barely adequate slope protection in places on the upstream slope.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 Procedures

The City of Claremont has operated Whitewater Brook Dam No. 2 since it was constructed in 1968. The water level is maintained by an ungated spillway located at the east end of the dam. The reservoir can be lowered by the opening of three gate valves, which are manually operated. These gate valves control the flow into the gate house through a 12-inch pipe, a 16-inch pipe, and a 48-inch pipe. For further details see Section 1.2.i.

4.2 Maintenance of Dam

The maintenance of Whitewater Brook Dam No. 2 is the responsibility of the Water Department of the city of Claremont.

4.3 Maintenance of Operating Facilities

The dam is checked daily by either Mr. William E. Blaisdell, Superintendent of the Water Department, or by personnel designated by him. Maintenance of the facilities to operate the gate valves controlling the flow through the intake structure is good.

4.4 Description of any Warning System in Effect

A flood warning system is non-existent.

4.5 Evaluation

The current operational and maintenance procedure consisting of daily inspection should insure that all problems encountered can be remedied within a reasonable period of time.

SECTION 5 - HYDRAULIC/HYDROLOGIC

5.1 Evaluation of Features

a. Design Data

(1) This dam falls under the category of high hazard potential, and it is intermediate in size. Using the "Recommended Guidelines for Safety Inspection of Dams," the recommended spillway test flood peak inflow is equal to the probable maximum flood. The spillway test flood peak inflow is 9,667 cfs. The spillway test flood inflow hydrograph, estimated, is furnished in Appendix D.

(2) The computed maximum peak outflow is 9,358 cfs corresponding to the routed spillway test flood peak inflow. Refer to the computations in Appendix D.

(3) The reservoir storage capacity versus the elevation curve is furnished in Appendix D. This is obtained from the project records.

(4) The estimated discharge rating curve for the spillway is furnished in Appendix D.

(5) The hydrologic map of the watershed above the dam site, including reservoir area, watercourse, and elevation contours, is furnished in Appendix D.

b. Experience Data

Major floods occurred in 1936 and 1972. Maximum peak inflow in 1936 was 3,362 cfs. During the 1972 flood, there was significant erosion of the concrete on the downstream face of the spillway.

c. Visual Observations

The crest of the embankment dam is about 8 feet above the crest of the spillway. At the time of inspection, water was observed flowing over the spillway at a depth of 1/2 inch. The hydraulic design of the side-channel spillway is good, and the chute below the spillway was cut through rock. A stilling basin is provided at the end of the chute where it discharges into downstream Redwater Brook.

d. Overtopping Potential

The spillway test flood peak inflow adopted for this dam is 9,667 cfs. The estimated surcharge height over the spillway crest is 7.3 feet, and the corresponding maximum pool elevation is 974.3 msl. when the spillway test flood peak inflow is routed through the reservoir by an approximate method. As the elevation of the top of dam is 975.0 msl, the dam would not be overtopped due to spillway test flood inflow. Refer to Appendix D for further particulars.

SECTION 6 - STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations

The upstream slope could not be seen due to the fact that it was underwater. The slopes of the embankment do not show any erosion or other weak areas. The visual inspection revealed no evidence of stability problems.

b. Design and Construction Data

Design drawings, dated 1966, were obtained from Fenton G. Keyes Associates of Providence, Rhode Island. No computations were available from the project records. This information may be in the design architect-engineers' files.

c. Operating Records

Except for a few records, which are listed in Appendix B, other operating records were not available at the office of the New Hampshire Water Resources Board. There are additional records, primarily construction reports, in the files of the Water Department at the Claremont City Hall.

d. Post-Construction Changes

Available records indicate that no changes were made to this dam after construction was completed in 1968.

e. Seismic Stability

The dam is located in Seismic Zone 2 and in accordance with recommended Phase I guidelines does not warrant seismic analyses.

SECTION 7 - ASSESSMENT, RECOMMENDATIONS, & REMEDIAL MEASURES

7.1 Dam Assessment

a. Condition

Examination of available documents and visual inspection of Whitewater Brook Dam No. 2 and its appurtenant structures did not reveal any defects which would render the project inadequate from the standpoint of structural stability, and the dam is judged to be in good condition.

b. Adequacy of Information

An adequate assessment of the dam consistent with the scope of a Phase I investigation has been made based upon the visual inspection and available information.

c. Urgency

The operational and maintenance measures enumerated in Section 7.3 should be implemented within two years after receipt of this report by the owner.

d. Need for Additional Investigation

At this time, there are no problems which would require additional investigation.

7.2 Recommendations

No major modifications or engineering investigation is recommended at this time.

7.3 Remedial Measures

Although the dam is generally maintained in good condition, it is considered important that the following operating and maintenance procedures be attended to as early as practical:

a. Vegetation should be removed from the dam embankment.

b. The barely adequate slope protection in places on the upstream slope should be repaired. A program should be prepared and initiated to repair the rest of the slope protection as it becomes necessary.

c. Upstream embankment slope should be inspected at low water.

d. Remove all debris and overhanging trees from the downstream channel.

e. A program of regular maintenance should be established.

f. A program of technical bi-annual periodic inspection of the project features should be prepared and initiated.

g. Round-the-clock surveillance should be provided during periods of high precipitation.

h. The owner should develop a formal warning system. An operational procedure to follow in the event of an emergency should be adopted.

7.4 Alternatives

None recommended.

APPENDIX A

VISUAL INSPECTION CHECK LISTS

APPENDIX A

VISUAL INSPECTION CHECK LIST
PARTY ORGANIZATION

PROJECT Whitewater Brook Dam No. 2

DATE June 7, 1978

TIME 1400-1800

WEATHER Cloudy

W.S. ELEV. 975.1 U.S. _____ DN.S.

PARTY:

1. Jurgis Gimbutas, P.E.	Team Captain - Structural and Concrete
2. Harvey H. Stoller, P.E.	Soils, Geology and Foundation
3. V. Rao Maddineni, P.E.	Hydraulics and Hydrology

PROJECT FEATURE	INSPECTED BY	REMARKS
1. Dam Embankment	H. H. Stoller	Good
2. Intake Channel	H. H. Stoller V. Rao Maddineni	(Underwater)
3. Intake Structure	J. Gimbutas	(Underwater)
4. Gate House	J. Gimbutas	Good
5. Outlet Works - Conduit	J. Gimbutas	(Buried)
6. Outlet Structure	J. Gimbutas	Good
7. Outlet Channel	H. H. Stoller V. R. Maddineni	Good
8. Spillway Weir	J. Gimbutas	Good

	PROJECT FEATURE	INSPECTED BY	REMARKS
9.	Approach Channel and Spillway Chute	H. H. Stoller V. R. Maddineni	Good
10.	Footbridge	J. Gimbutas	Good
11.	Reservoir and Downstream Channel	V. R. Maddineni	Good

PERIODIC INSPECTION CHECK LIST

PROJECT Whitewater Brook Dam No. 2 DATE June 7, 1978

PROJECT FEATURE Dam Embankment

DISCIPLINE Soils & Foundations NAME Henry H. Stiller

PROJECT FEATURE

DISCIPLINE NAME

DISCIPLINE NAME

AREA EVALUATED	CONDITION
DAM EMBANKMENT	
Crest Elevation	975.0 M.S.L.
Current Pool Elevation	967.04 M.S.L.
Maximum Impoundment to Date	Unknown
Surface Cracks	None observed
Pavement Condition	None
Movement or Settlement of Crest	None observed
Lateral Movement	None observed
Vertical Alignment	No visual vertical misalignment observed
Horizontal Alignment	No visual horizontal misalignment observed
Condition at Abutment and at Concrete Structures	Normal

PERIODIC INSPECTION CHECK LIST

PROJECT Whitewater Brook Dam No. 2 DATE June 7, 1978

PROJECT FEATURE Dam Embankment

DISCIPLINE Soils & Foundations NAME Harry A. Stiller

PROJECT FEATURE _____

DISCIPLINE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
Indications of Movement of Structural Items on Slopes	None observed
Trespassing on Slopes	None apparent
Sloughing or Erosion of Slopes or Abutments	None observed
Rock Slope Protection - Riprap Failures	Upstream slope poor to fair condition. Downstream slope fair condition
Unusual Movement or Cracking at or Near Toes	None observed
Unusual Embankment or Downstream Seepage	None observed
Piping or Boils	None observed
Foundation Drainage Features	Could not be observed
Toe Drains	Could not be observed
Instrumentation System	None

PERIODIC INSPECTION CHECK LIST

PROJECT Whitewater Brook Dam No. 2 DATE June 7, 1978

PROJECT FEATURE Intake Structures

DISCIPLINE Structures NAME [illegible]

PROJECT FEATURE Intake Channel

DISCIPLINE Soils & Foundations NAME Henry H. Keller

DISCIPLINE Hydraulics & Hydrology NAME [illegible]

AREA EVALUATED	CONDITION
OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE	
a. Intake Channel	Invert Elevation 897.0 M.S.L. Water level at the time of observation, Elevation 967.04 M.S.L.
Slope Conditions	Could not be observed
Bottom Conditions	Could not be observed
Rock Slides or Falls	Not observed
Log Boom	None
Debris	Some near spillway
Condition of Concrete Lining	None
Drains or Weep Holes	None
b. Intake Structure	
Condition of Concrete	Could not be observed
Trash Rack	Could not be observed

PERIODIC INSPECTION CHECK LIST

PROJECT Whitewater Brook Dam No. 2 DATE June 7, 1978

PROJECT FEATURE Gate House

DISCIPLINE Structures & Concrete NAME [illegible]

PROJECT FEATURE _____

DISCIPLINE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
OUTLET WORKS - GATE HOUSE	
a. Concrete and Structural	
General Condition	Good condition
Condition of Joints	Normal
Spalling	None observed
Visible Reinforcing	None observed
Rusting or Staining of Concrete	None observed
Any Seepage or Efflorescence	None observed
Joint Alignment	Normal
Unusual Seepage or Leaks in Gate Chamber	None observed
Cracks	None observed
Rusting or Corrosion of Steel	None observed

PERIODIC INSPECTION CHECK LIST

PROJECT Whitewater Brook Dam No. 2 DATE June 7, 1978

PROJECT FEATURE Gate House

DISCIPLINE Structures & Concrete NAME T.M. Mitra

PROJECT FEATURE

DISCIPLINE NAME

DISCIPLINE NAME

AREA EVALUATED	CONDITION
b. Mechanical and Electrical	
Air Vents	None
Float Wells	None
Crane Hoise	None
Elevator	None
Hydraulic System	None
Service Valves	3 gate valves, manually operated
Emergency Gates	None
Lightning Protection System	None
Emergency Power System	None
Wiring and Lighting System in	None

PERIODIC INSPECTION CHECK LIST

PROJECT Whitewater Brook Dam No. 2 DATE June 7, 1978

PROJECT FEATURE Conduit

DISCIPLINE Structures & Concrete NAME [illegible]

PROJECT FEATURE

DISCIPLINE NAME

DISCIPLINE NAME

AREA EVALUATED	CONDITION
OUTLET WORKS - (48-INCH) CONDUIT	
General Condition of Concrete	Could not be observed

PERIODIC INSPECTION CHECK LIST

PROJECT Whitewater Brook Dam No. 2 DATE June 7, 1978

PROJECT FEATURE Outlet Structure

DISCIPLINE Structures & Concrete NAME [signature]

PROJECT FEATURE Outlet Channel

DISCIPLINE Soils & Foundations NAME [signature]

DISCIPLINE Hydraulics & Hydrology NAME [signature]

AREA EVALUATED	CONDITION
OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL	
General Condition of Concrete	Could not be observed due to fact that it is buried below ground surface
Channel	Could not be found, see narative

PERIODIC INSPECTION CHECK LIST

PROJECT Whitewater Brook Dam No. 2 DATE June 7, 1978

PROJECT FEATURE Spillway Weir

DISCIPLINE Structures & Concrete NAME Grimmitt

PROJECT FEATURE Approach Channel

DISCIPLINE Soils & Foundations NAME Henry H. Stiller

DISCIPLINE Hydraulics & Hydrology NAME L. Pat Viechnicki

AREA EVALUATED	CONDITION
OUTLET WORKS - SPILLWAY WEIR, APPROACH CHANNEL AND SPILLWAY CHUTE	
a. Approach Channel	
General Condition	Good condition
Loose Rock Overhanging Channel	None observed
Trees Overhanging Channel	None observed
Floor of Approach Channel	Could not be observed
b. Spillway Weir	
General Condition of Concrete	Good
Rust or Staining	Patches of concrete on the downstream side of spillway
Spalling	None observed

PERIODIC INSPECTION CHECK LIST

PROJECT Whitewater Brook Dam No. 2 DATE June 7, 1978

PROJECT FEATURE _____

DISCIPLINE _____ NAME _____

PROJECT FEATURE Spillway Chute

DISCIPLINE Soils & Foundations NAME Henry H. Stiller

DISCIPLINE Hydraulics & Hydrology NAME [illegible]

AREA EVALUATED	CONDITION
Any Visible Reinforcing	None observed
Any Seepage or Efflorescence	Efflorescence from construction joint at the center approximately at the top of spillway
Drain Holes	None observed
c. Spillway Chute	
General Condition	Good condition
Loose Rock Overhanging Channel	None observed
Trees Overhanging Channel	None observed
Floor of Channel	Good condition
Other Obstructions	Old slide, minor in nature, will not significantly impede the flow in channel

PERIODIC INSPECTION CHECK LIST

PROJECT Whitewater Brook Dam No. 2 DATE June 7, 1978

PROJECT FEATURE Footbridge

DISCIPLINE Structures & Concrete NAME [illegible]

PROJECT FEATURE _____

DISCIPLINE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
OUTLET WORKS - FOOTBRIDGE	
a. Superstructure	
Bearings	None
Anchor Bolts	None
Bridge Seat	Good condition
Longitudinal Members	Good condition - precast concrete
Underside of Deck	Good condition - cast-in-place concrete slab
Secondary Bracing	None
Deck	Good condition - cast-in-place concrete
Drainage System	None
Railings	Good condition - 1 1/2-inch pipe railing

PERIODIC INSPECTION CHECK LIST

PROJECT Whitewater Brook Dam No. 2 DATE June 7, 1978

PROJECT FEATURE Footbridge

DISCIPLINE Structures & Concrete NAME [illegible]

PROJECT FEATURE

DISCIPLINE NAME

DISCIPLINE NAME

AREA EVALUATED	CONDITION
Expansion Joint	Good condition - none observed at the west abutment
Paint	Good condition - railings only
c. Abutment and Piers	
General Condition of Concrete	Good condition
Alignment of Abutment	Good condition
Approach to Bridge	Good
Condition of Seat and Backwall	Good condition

APPENDIX B

EXISTING AVAILABLE INFORMATION

APPENDIX B

1. Listing of Records and their Location

Fenton G. Keyes Associates, Architects-Engineers, 321 So. Main Street, Providence, Rhode Island, have original tracings of their design for Whitewater Brook Dam No. 2; a total 25 drawings made in 1966, and other contract documents. A set of these drawings (blueprints) is filed at the City Hall in Claremont, New Hampshire. The Water Department in Claremont City Hall has some construction reports, billings, and correspondence files of 1967, and later years.

The New Hampshire Water Resources Board in Concord, New Hampshire, 37 Pleasant Street, has a file of records and correspondence, filed under Town Dam No. 47/30. They also have a set of blueprints of Fenton G. Keyes' drawings.

The documents of importance to the design and maintenance, which are filed in Concord, are the following:

(1) December 19, 1940. Report on an additional water supply for the Town of Claremont, New Hampshire. By Weston and Sampson, Consulting Engineers, Boston, Massachusetts. A booklet of 28 printed pages.

(2) January 27, 1965. Memorandum from Messrs. Francis C. Moore and Vernon A. Knowlton, Engineers of the New Hampshire Water Resources Board, listing their criticism of the submitted plans for Whitewater Brook Dams No. 1 and No. 2 (made by Fenton G. Keyes Associates) and some other related correspondence.

(3) May 1972. Flood routing calculations by Messrs. Francis C. Moore and George W. Stevens.

2. There are no reports of past inspections.

3. Plans included with this report are reductions of Fenton G. Keyes Associates' design drawings for Whitewater Brook Dam No. 2., dated October, 1966. Their titles are:

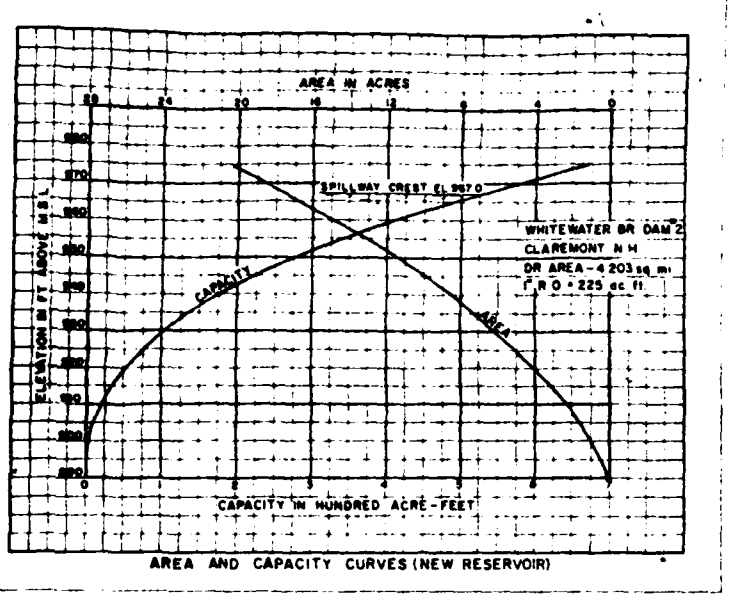
Sheet 2 of 22 - Reservoir Plan, Scale 1" = 200'

Sheet 7 of 22 - General Plan and Sections, Scales: 1" = 50' and 1" = 30'

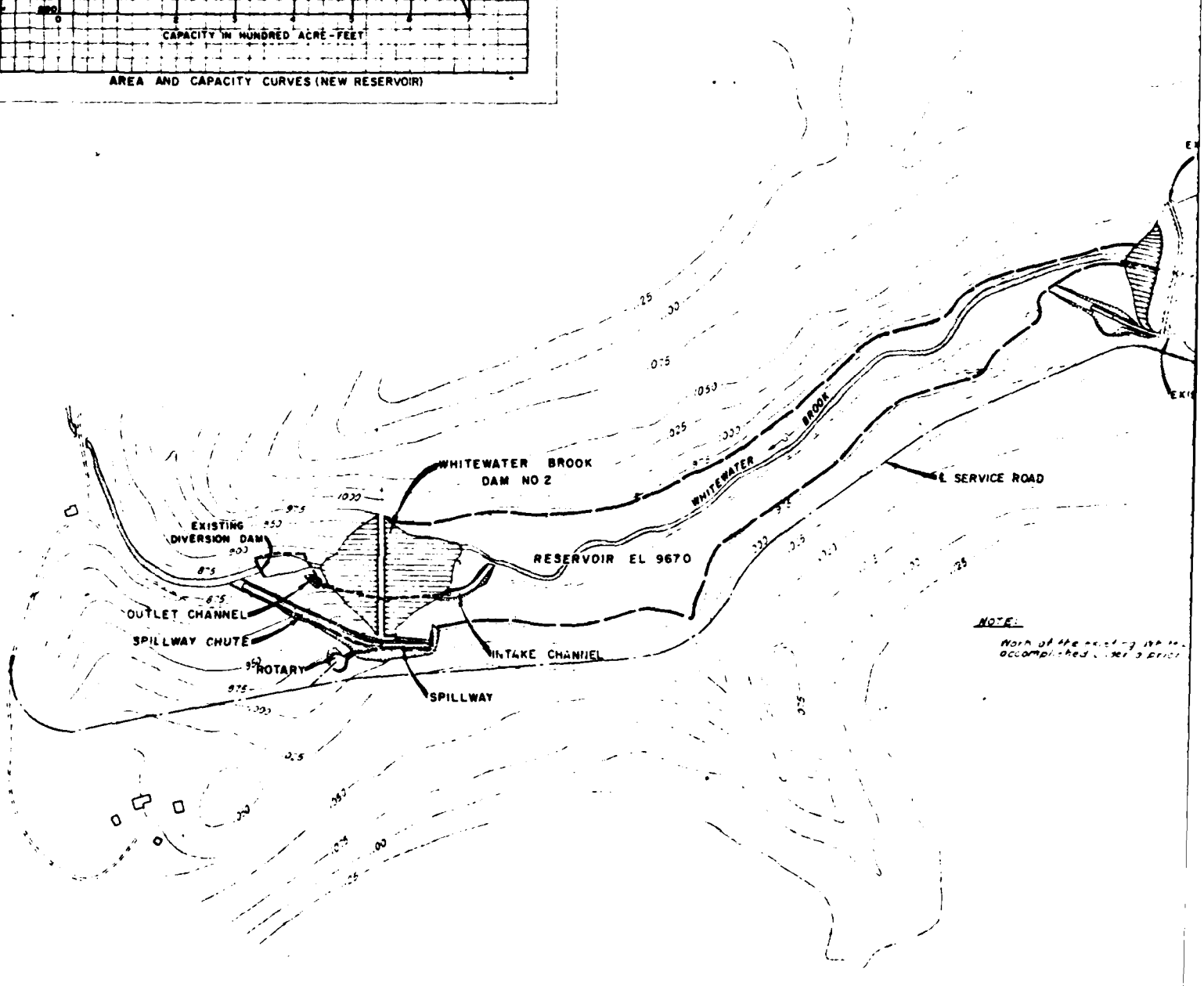
Sheet 9 of 22 - Embankment Details No. 2, Scale 1" = 20'

Sheet 11 of 22 - Spillway Weir and Approach

Sheet 13 of 22 - Outlet Works, Plan and Sections

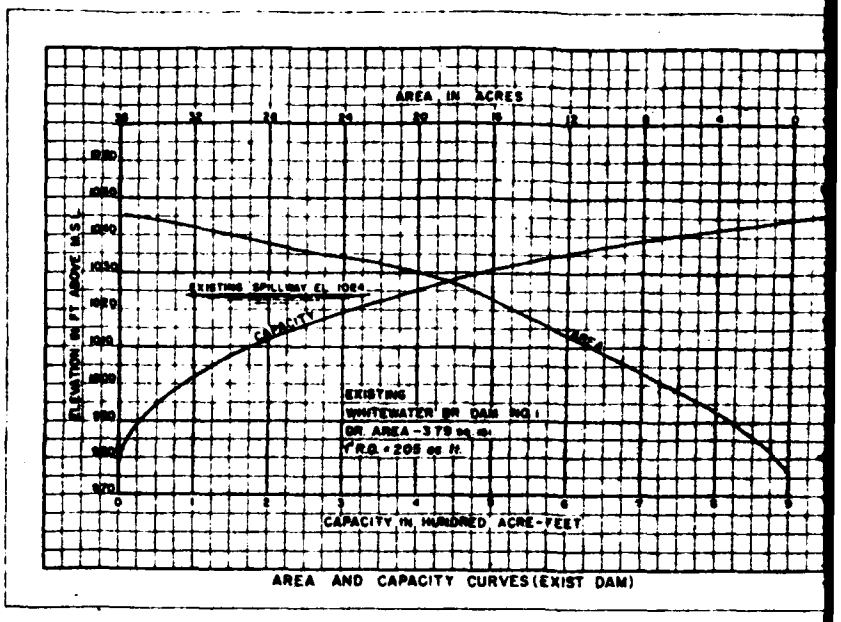


AREA AND CAPACITY CURVES (NEW RESERVOIR)

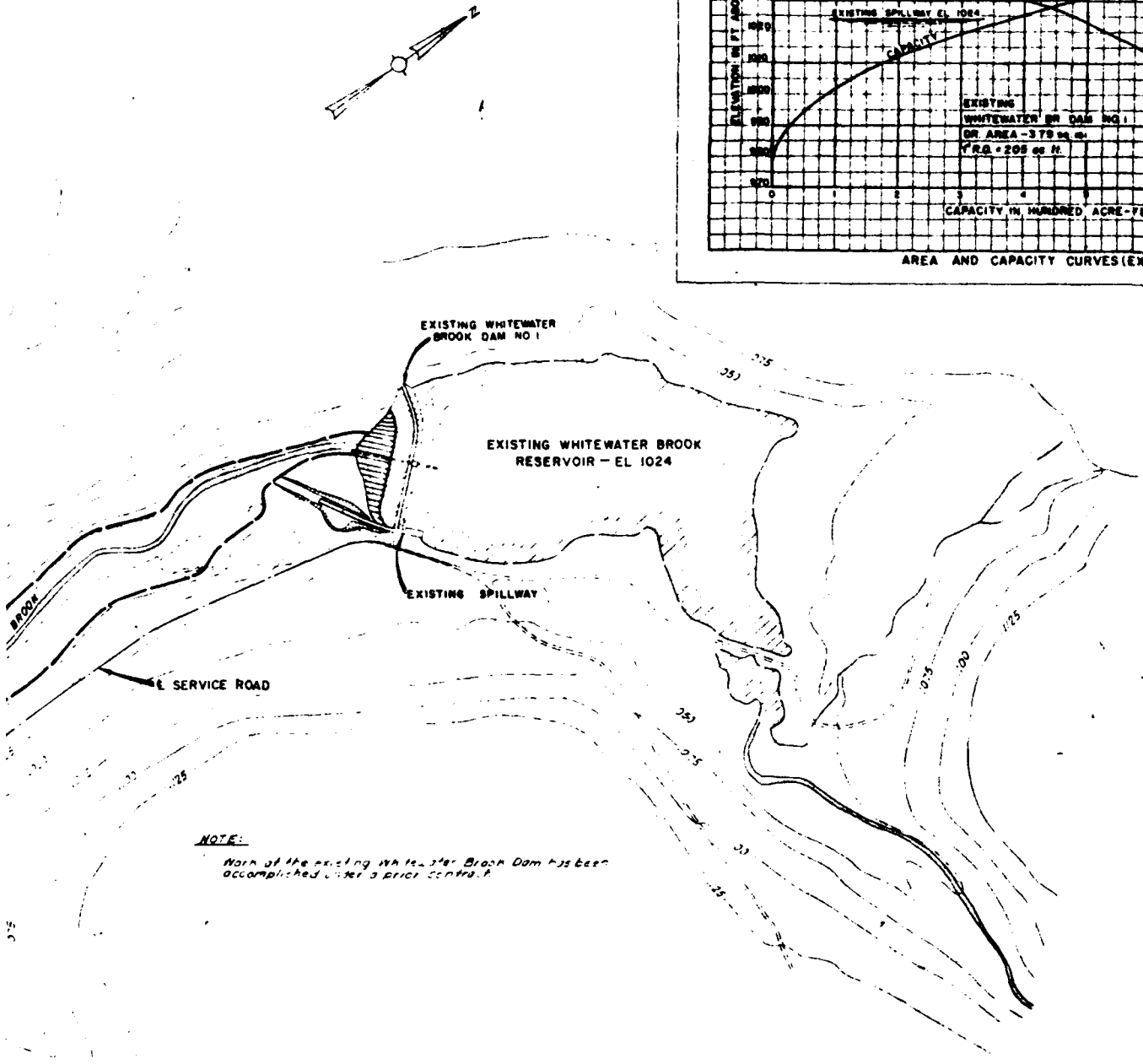


RESERVOIR PLAN

SCALE 1" = 200'-0"



AREA AND CAPACITY CURVES (EXIST DAM)



RESERVOIR PLAN

SCALE 1" = 200'-0"

PROJECT NO. WS-1-30-00

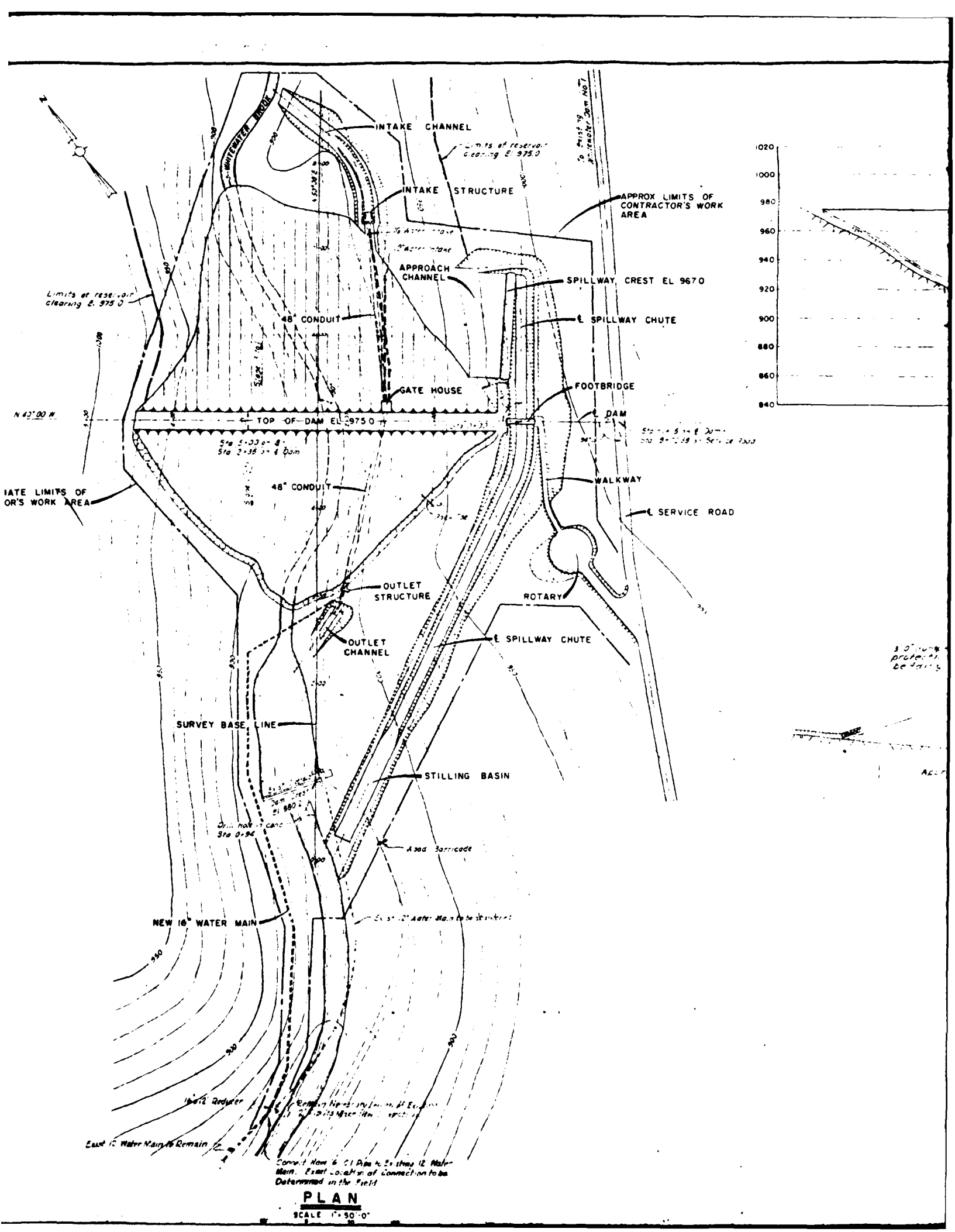
FGK

CLAREMONT, NEW HAMPSH

WHITEWATER BROOK DA

NO. 2

RESERVOIR PLAN



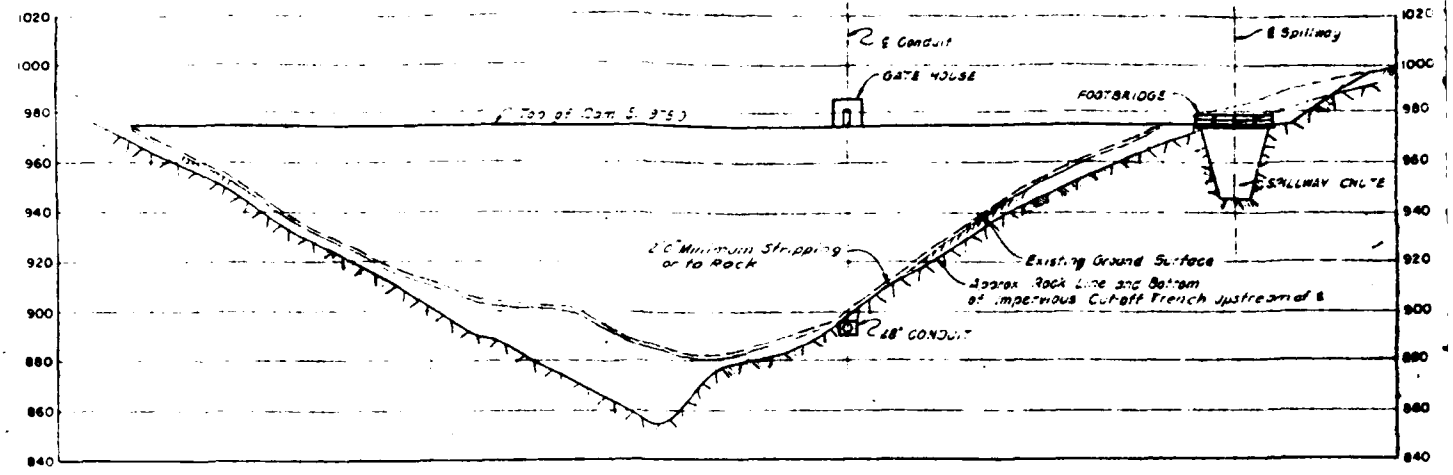
PLAN

SCALE 1" = 50'-0"

ROX LIMITS OF
TRACTOR'S WORK
A

EST EL 9670

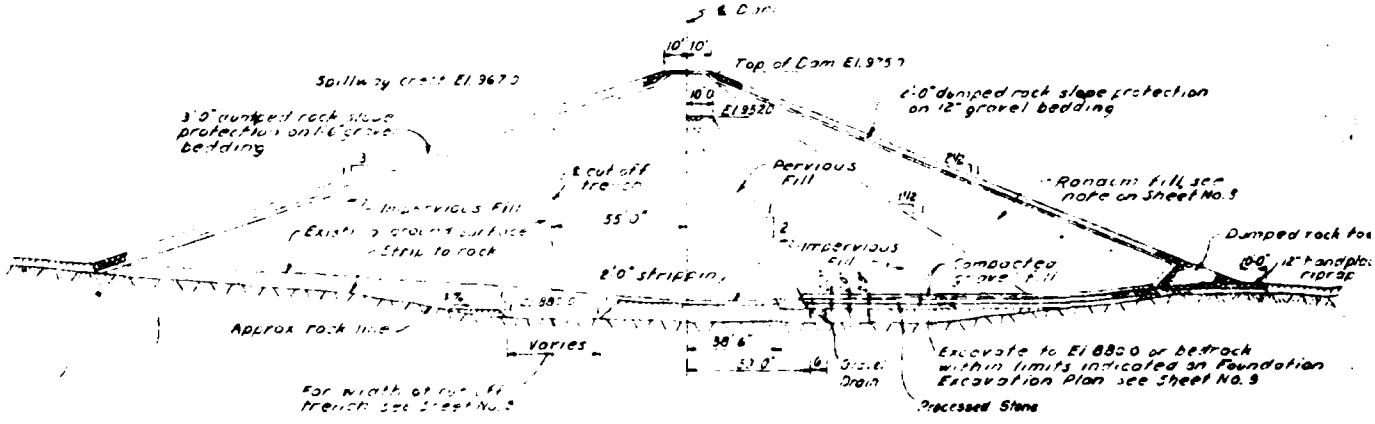
CHUTE



SECTION ALONG ℄ DAM

SCALE 1" = 30'-0"

℄ SERVICE ROAD



SECTION AT STA. 2+08

SCALE 1" = 30'-0"

NOTES

1. Contour interval is 2 feet
2. Bearings are magnetic
3. Elevations refer to Mean Sea Level Datum
4. For details of Outlet Works see Sheet No 5 & 6
5. For details of Spillway see Sheet No 10 & 11
6. For details of Footbridge see Sheet No 19
7. For details of Service Road see Sheet No 20
8. For Subsurface Explorations see Sheet No. 4
9. For details of Rotary and A.B.A. see Sheet No 21
10. For details of Wood Barricade, see Sheet No 21

PROJECT NO. WS-1-30-0011

FGK

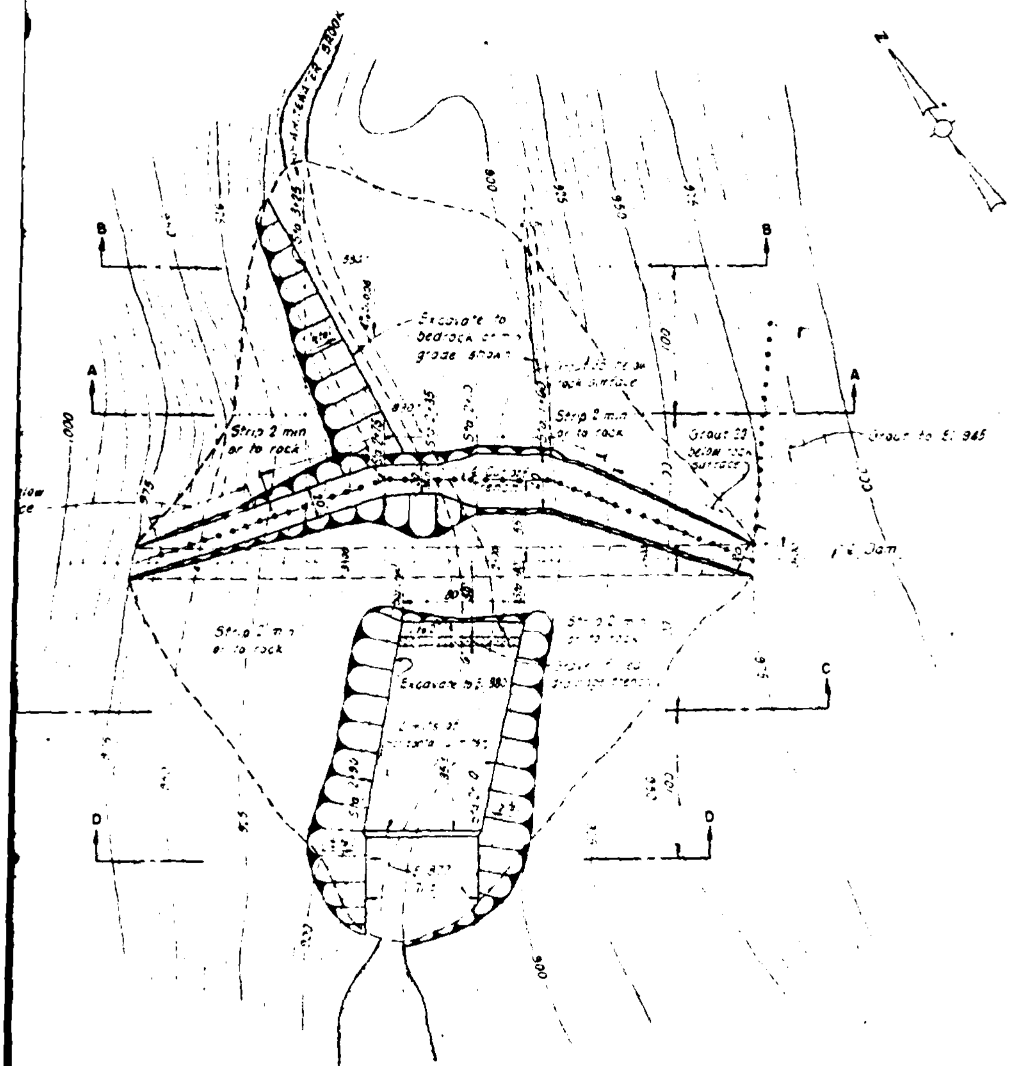
FENTON, GRAY & KEEFE ASSOCIATES
ARCHITECTS & ENGINEERS

CLAREMONT, NEW HAMPSHIRE

WHITEWATER BROOK DAM
NO. 2

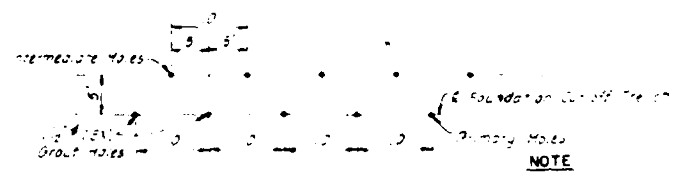
GENERAL PLAN AND SECTIONS

7 of 2



FOUNDATION EXCAVATION PLAN

SCALE 1" = 50'-0"

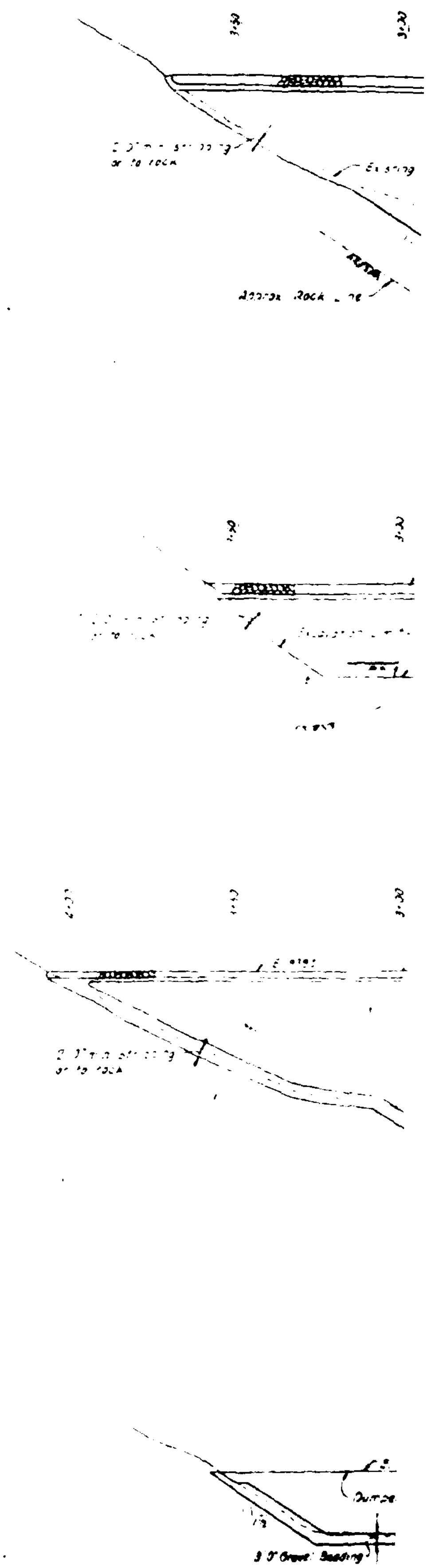


TYPICAL LAYOUT FOR GROUT HOLES

SCALE 1" = 10'-0"

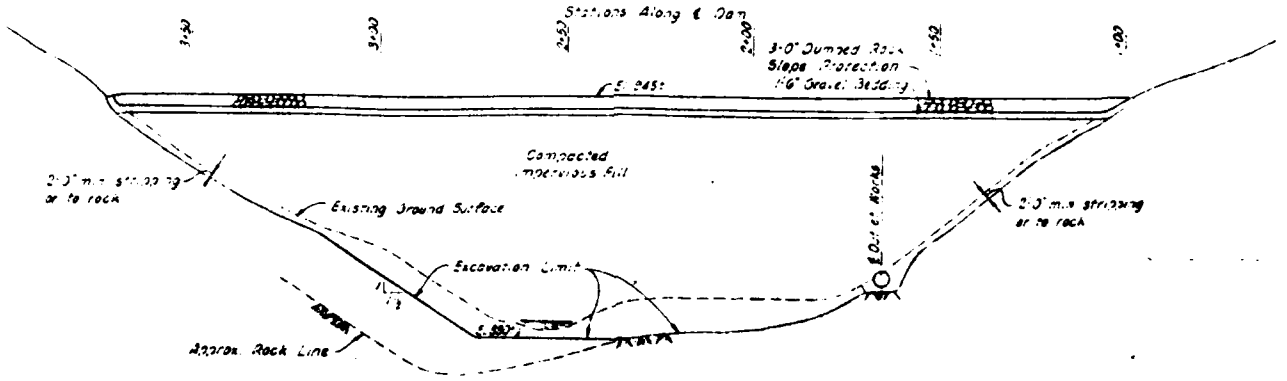
NOTE

[illegible] depth & spacing of grout holes shown are tentative only. Data to be disclosed during construction and determine the amount and method of grouting.

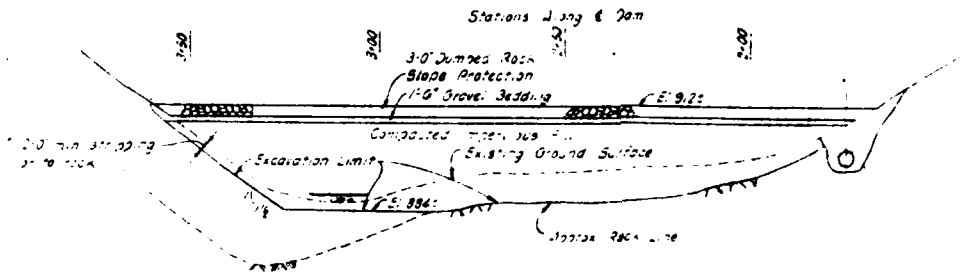


SEC

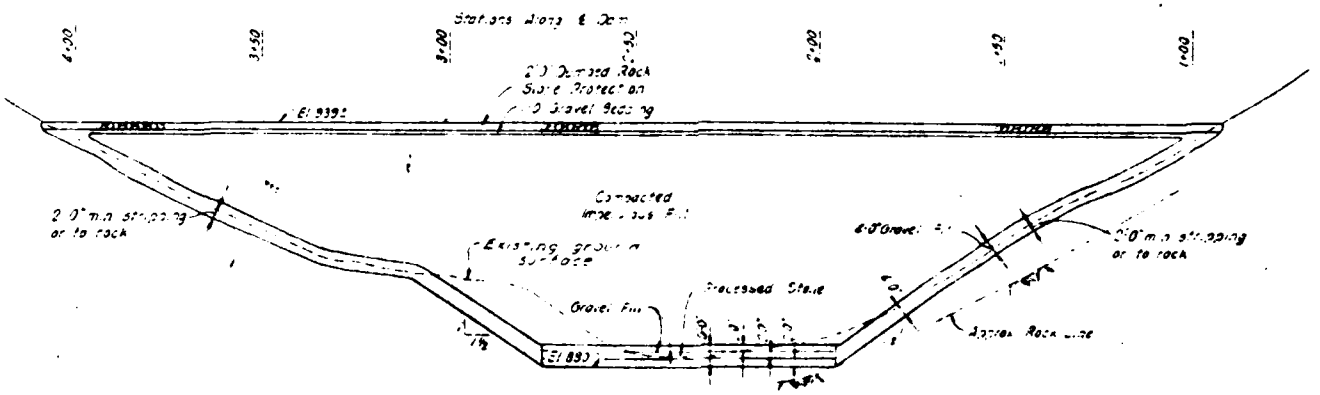
SCA



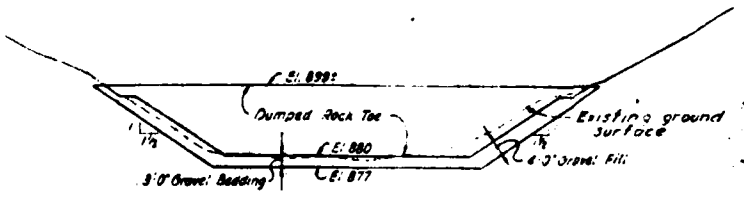
SECTION A-A
SCALE 1" = 20'-0"



SECTION B-B
SCALE 1" = 20'-0"



SECTION C-C
SCALE 1" = 20'-0"



SECTION D-D
SCALE 1" = 20'-0"

PROJECT NO. WS-1-30-0011

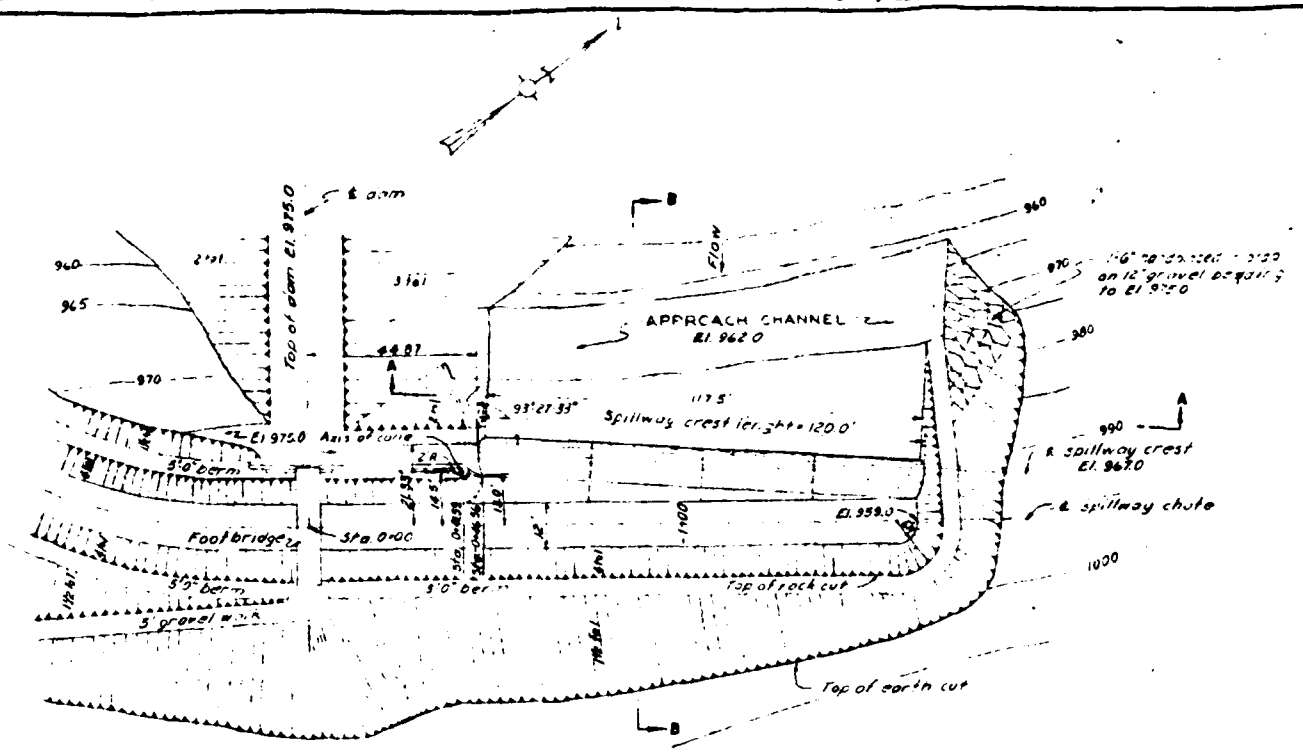
FGK

PENTON, GREEN AND ASSOCIATES
ARCHITECTS & ENGINEERS

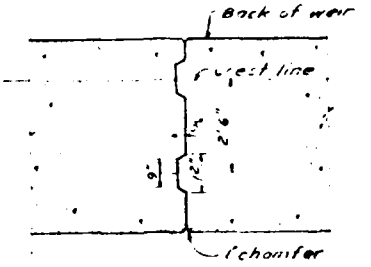
CLAREMONT, NEW HAMPSHIRE

WHITEWATER BROOK DAM NO. 2

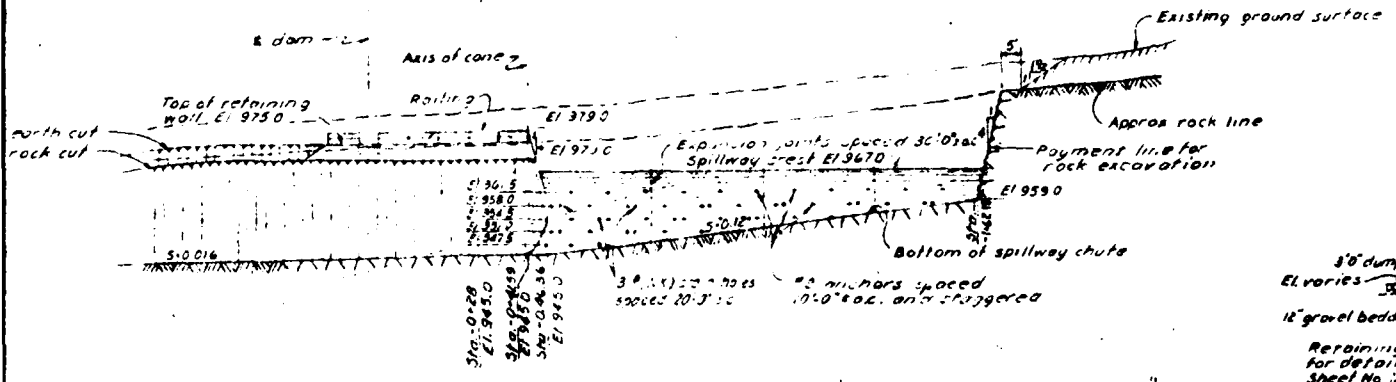
EMBANKMENT DETAILS NO. 2

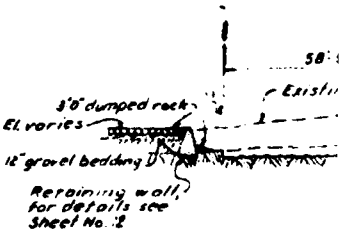


PLAN
SCALE 1" = 20'-0"

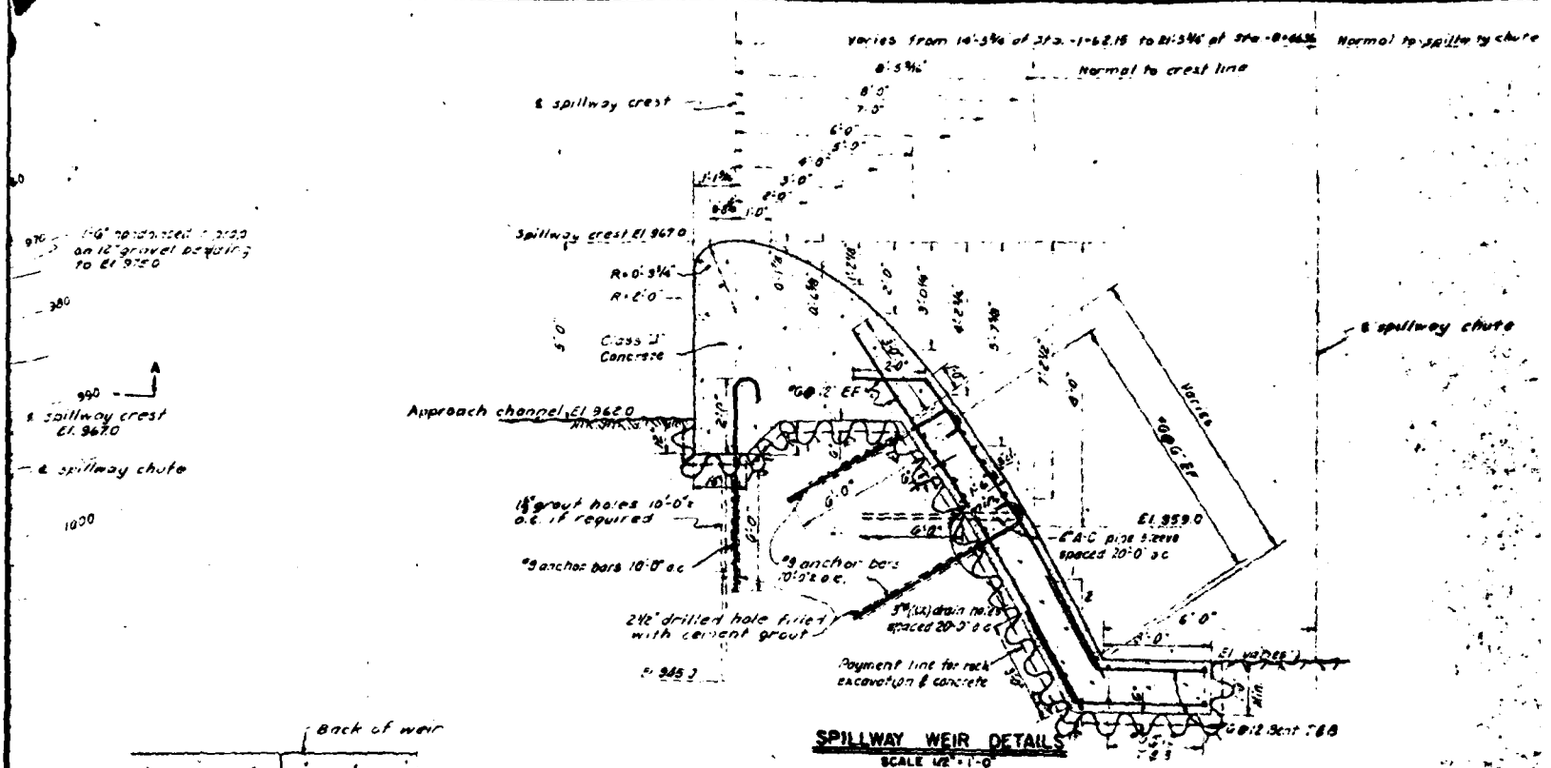


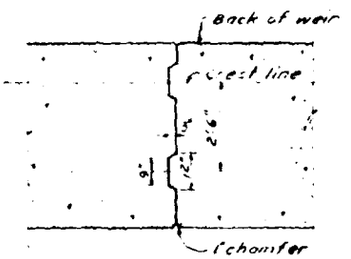
SPILLWAY WEIR EXPANSION JT. DETAIL
SCALE 1/2" = 1'-0"



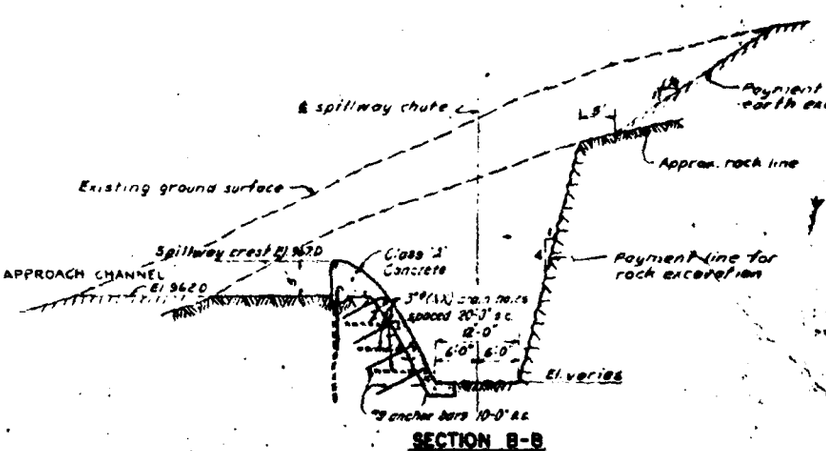


ELEVATION ALONG ℄ OF SPILLWAY
SCALE 1" = 20'-0"

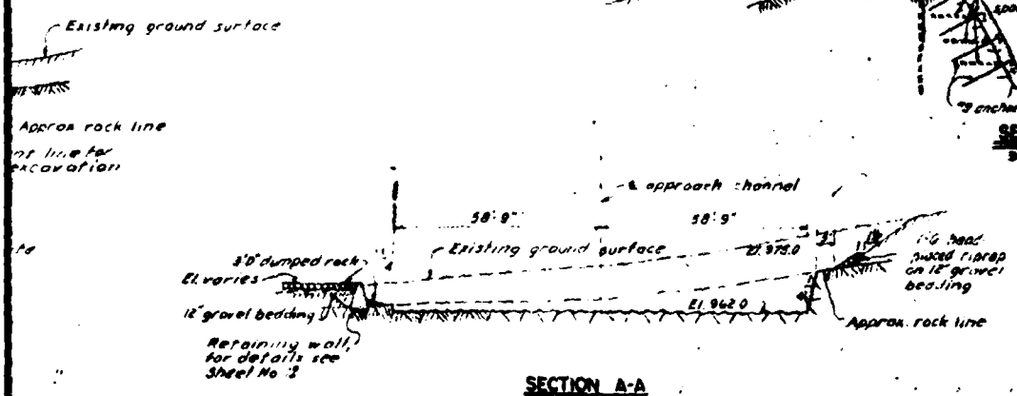




SPILLWAY WEIR EXPANSION JT. DETAIL
SCALE 1/2"=1'-0"



SECTION B-B
SCALE 1"=10'-0"



SECTION A-A
SCALE 1"=20'-0"

NOTES:

1. Elevations refer to Mean Sea Level Datum.
2. Location, depth and spacing of grout holes shown are tentative only. Conditions disclosed during construction shall determine the amount and method of grouting.
3. Drain holes at El 958.0 and 964.5 shall extend 6'-0" into rock and drain holes at El 956.0 and 947.5 shall extend 8'-0" into rock.

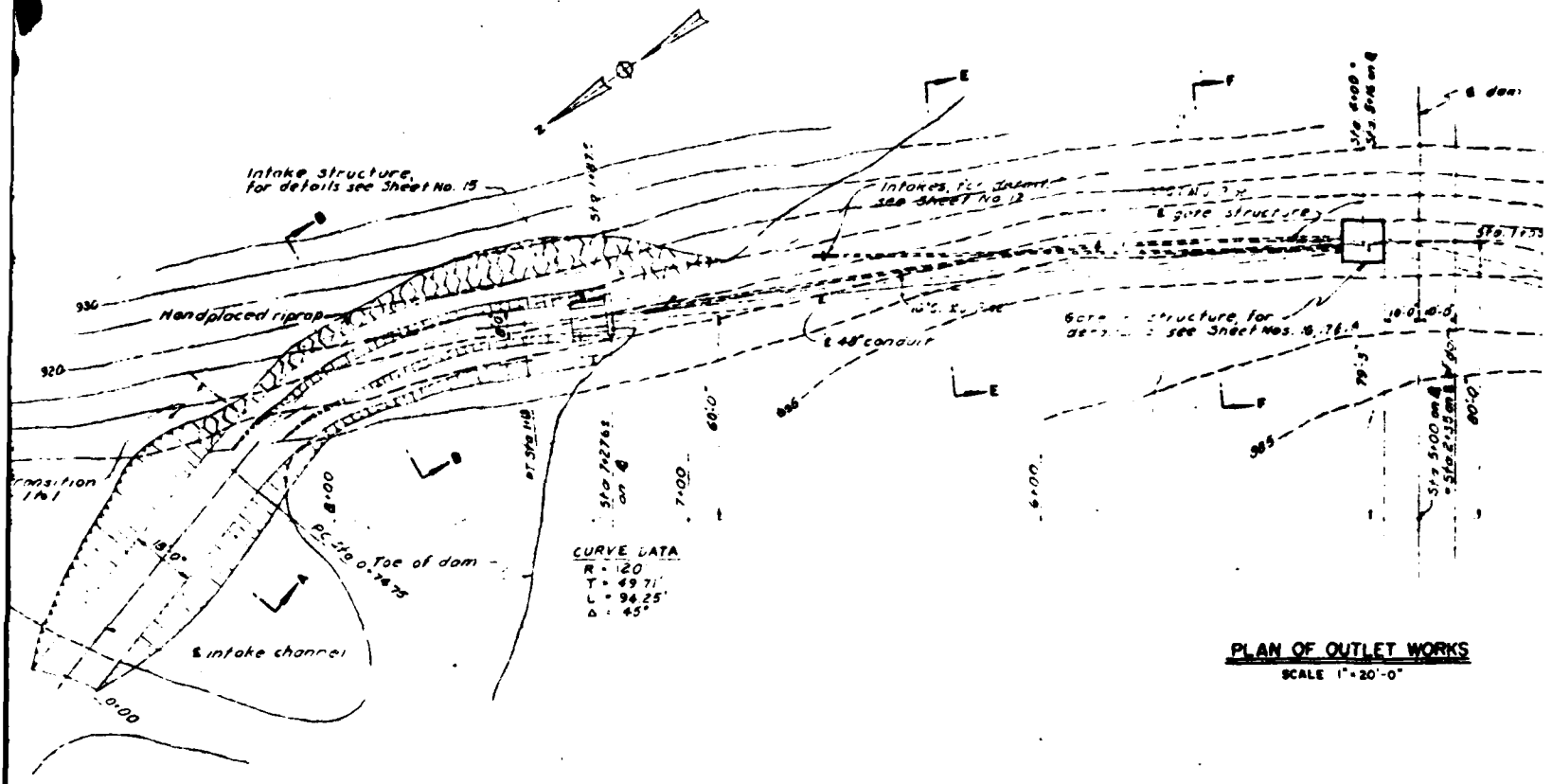
PROJECT NO. WS-1-30-0011

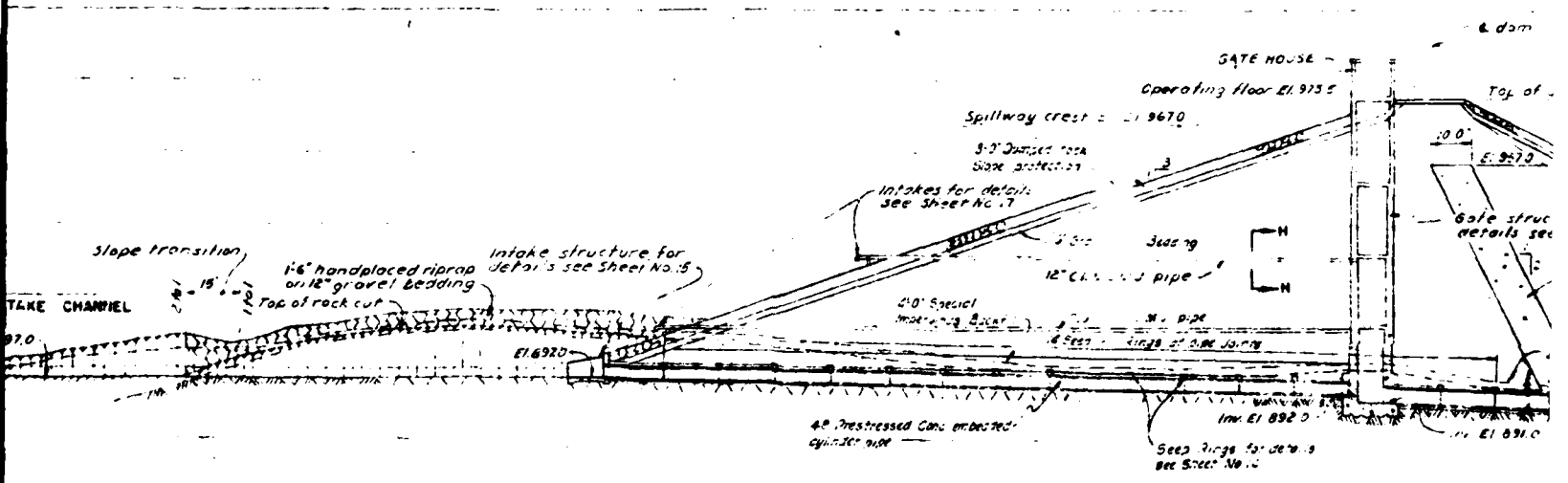
FGK

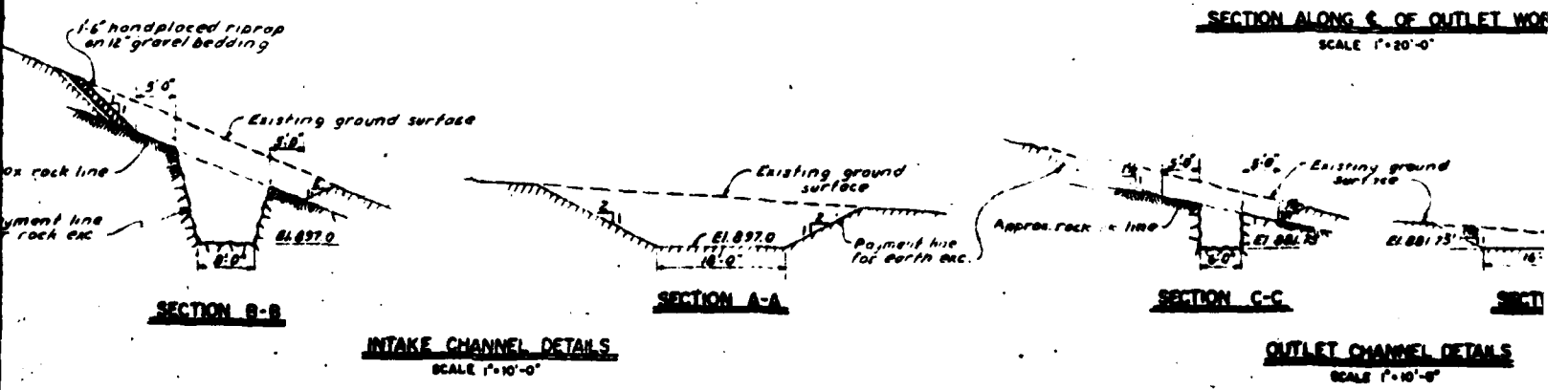
CLAREMONT, NEW HAMPSHIRE

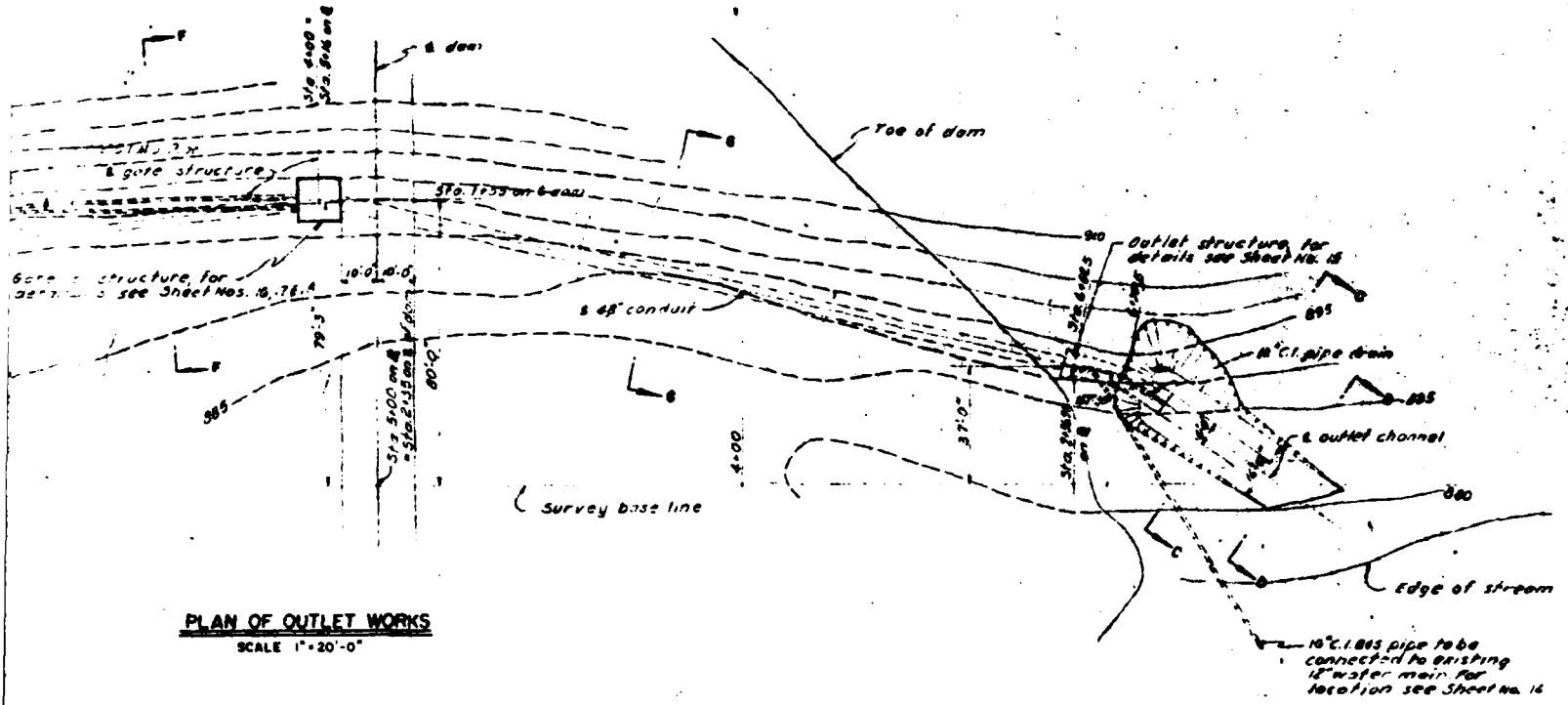
WHITEWATER BROOK DAM NO. 2

SPILLWAY, WEIR AND APPROACH

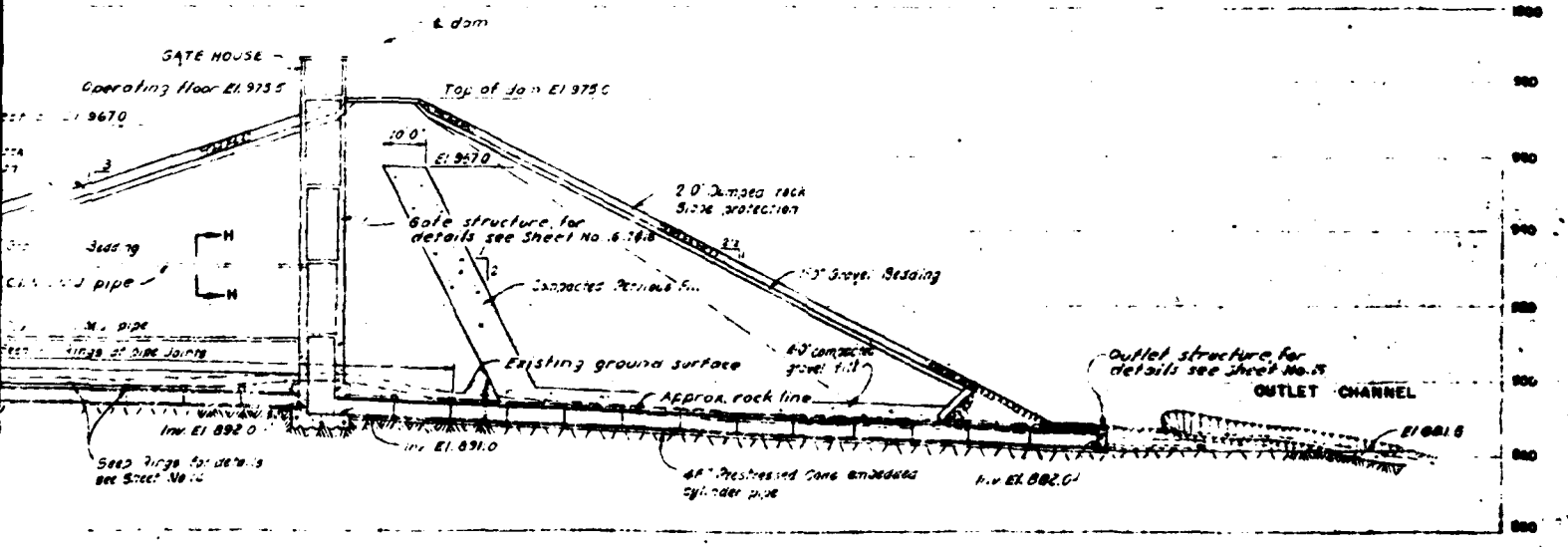

Intake structure, for details see Sheet No. 15
Intakes, for details see Sheet No. 12
Handplaced riprap
℄ 48" conduit
Gate structure for details see Sheet Nos. 16, 16-A
Transition
℄ intake channel
Toe of dam
CURVE DATA
R = 120
T = 49.71'
L = 94.25'
Δ = 45°
PLAN OF OUTLET WORKS
SCALE 1" = 20'-0"


GATE HOUSE
Operating floor El. 973.5
Spillway crest
Intakes for details see Sheet No. 17
Slope transition
1:6" handplaced riprap on 12" gravel bedding
Intake structure for details see Sheet No. 15
Top of rock cut
El. 892.0
48" Prestressed Conc. embedded cylinder pipe
Seep rings for details see Sheet No. 16
SECTION ALONG ℄ OF OUTLET WORKS
SCALE 1" = 20'-0"

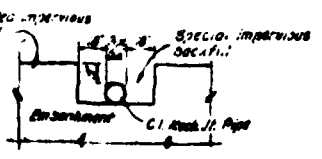

1:6" handplaced riprap on 12" gravel bedding
Existing ground surface
El. 897.0
Payment line for earth exc.
Approx. rock line
SECTION B-B
SECTION A-A
SECTION C-C
INTAKE CHANNEL DETAILS
SCALE 1" = 10'-0"
OUTLET CHANNEL DETAILS
SCALE 1" = 10'-0"



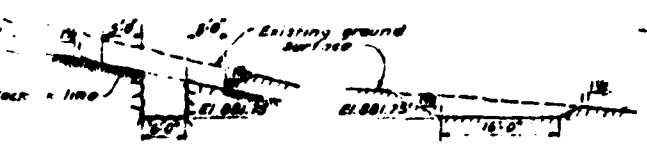
PLAN OF OUTLET WORKS
SCALE 1"=20'-0"



SECTION ALONG ℄ OF OUTLET WORKS
SCALE 1"=20'-0"



SECTION H-H
SCALE 1/4"=1'-0"



SECTION C-C

SECTION D-D

OUTLET CHANNEL DETAILS
SCALE 1"=10'-0"

NOTES:
1. For sections E-E, F-F and G-G see Sheet No. 14
2. Elevations refer to Mean Sea Level Datum.
3. Intake pipe shall be cast iron, mechanical joint with lock type feature.

PROJECT NO. WS-1-30-0011

FGK

CLAREMONT, NEW HAMPSHIRE
WHITEWATER BROOK DAM
NO. 2

OUTLET [illegible]
PLAN AND SECTIONS [illegible]

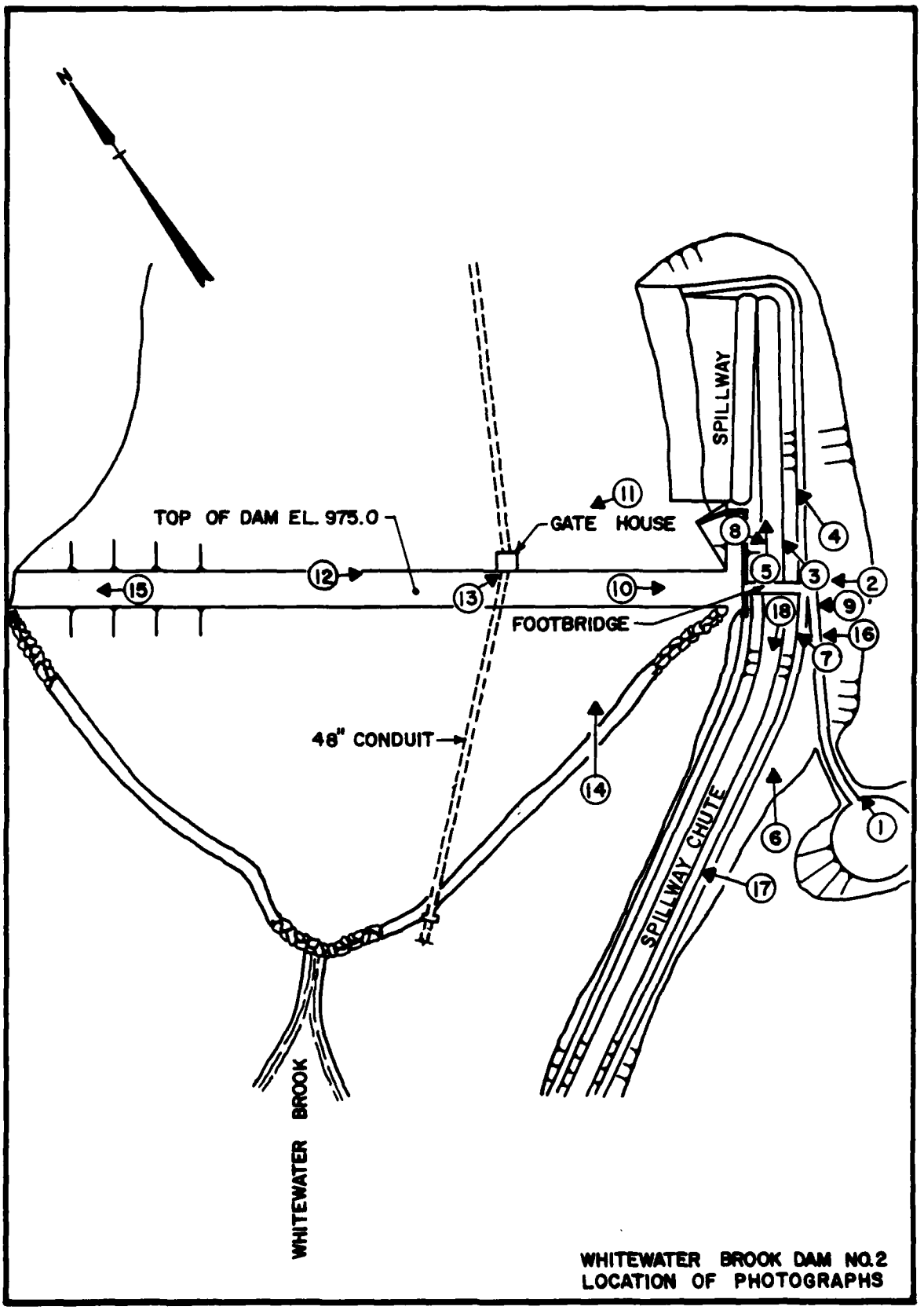
APPENDIX C

PHOTOGRAPHS

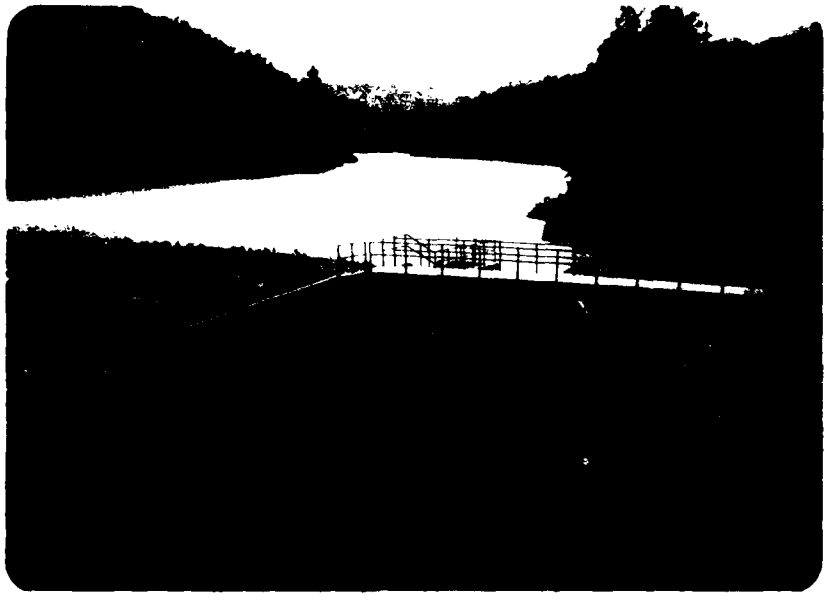
APPENDIX C

REPRESENTATIVE PHOTOGRAPHS OF PROJECT

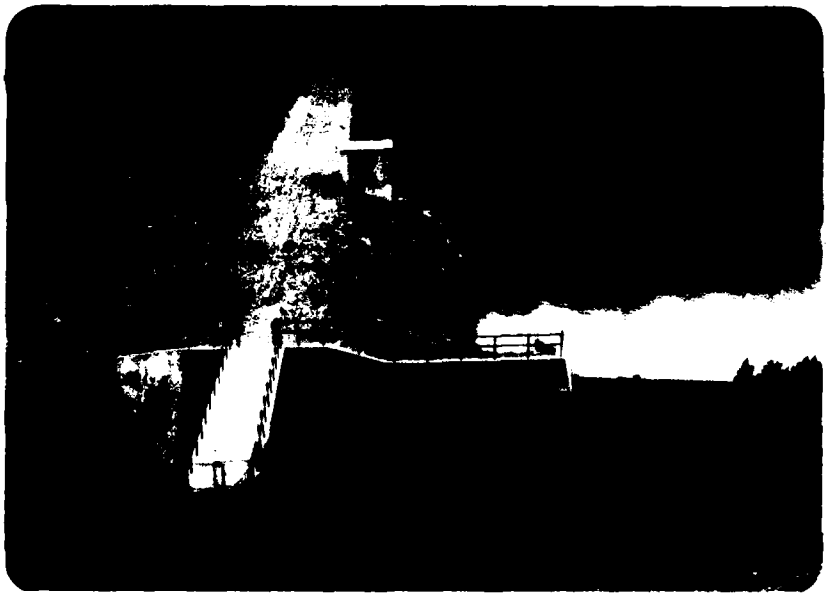
No.		Negative No.	Page
12.	Gate house, looking east. Spillway to the left.	6-27A	C-9
13.	Gate house, looking northeast.	6-24A	C-10
14.	Downstream slope of embankment, looking north.	6-23A	C-10
15.	Top of embankment at the right bank of the reservoir.	6-25A	C-11
16.	Downstream slope of embankment, looking southwest.	6-31A	C-11
17.	Exposed layers of ledge in the spillway chute near embankment downstream slope.	8-35A	C-12
18.	Spillway chute looking down from the service bridge.	6-19A	C-12



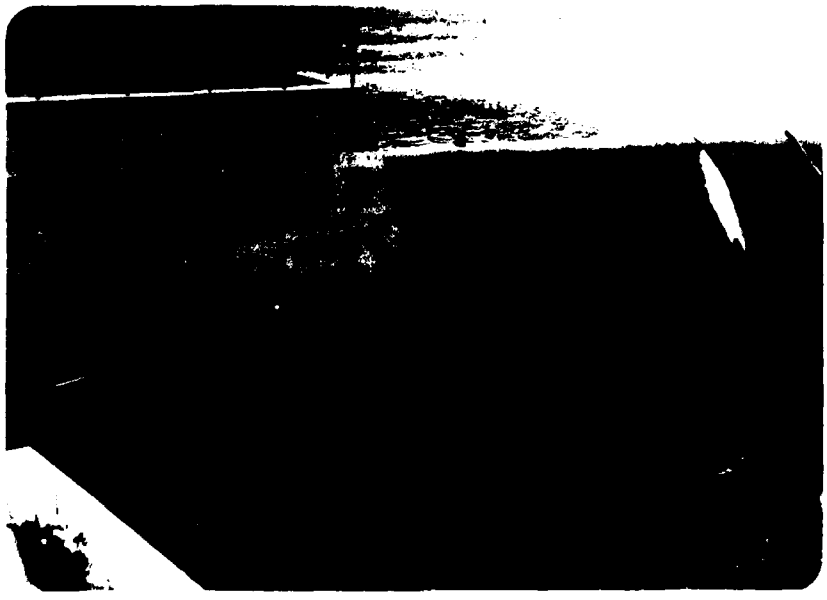
WHITEWATER BROOK DAM NO.2
LOCATION OF PHOTOGRAPHS



1. Whitewater Brook, Dam No. 2, Looking North.



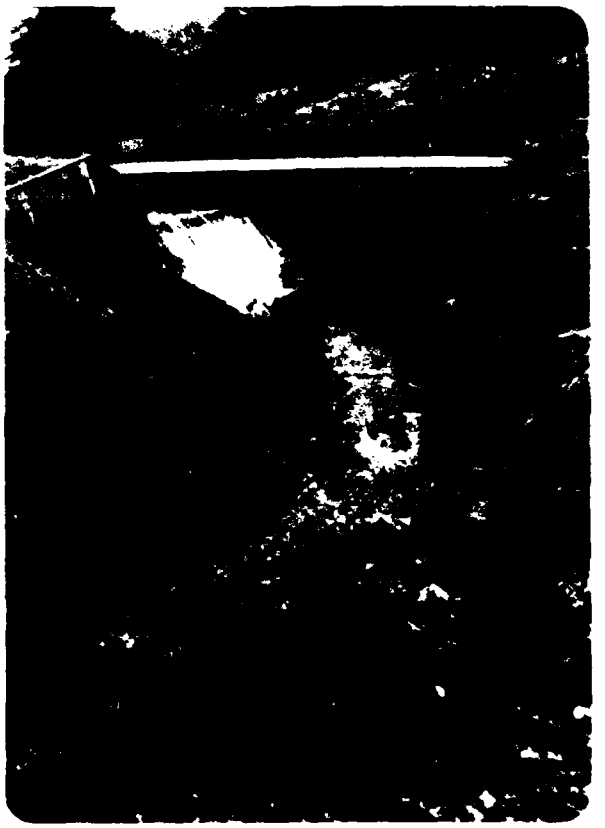
2. Dam Embankment, Looking West. The Spillway is Ce... to the Right of the Abutment.



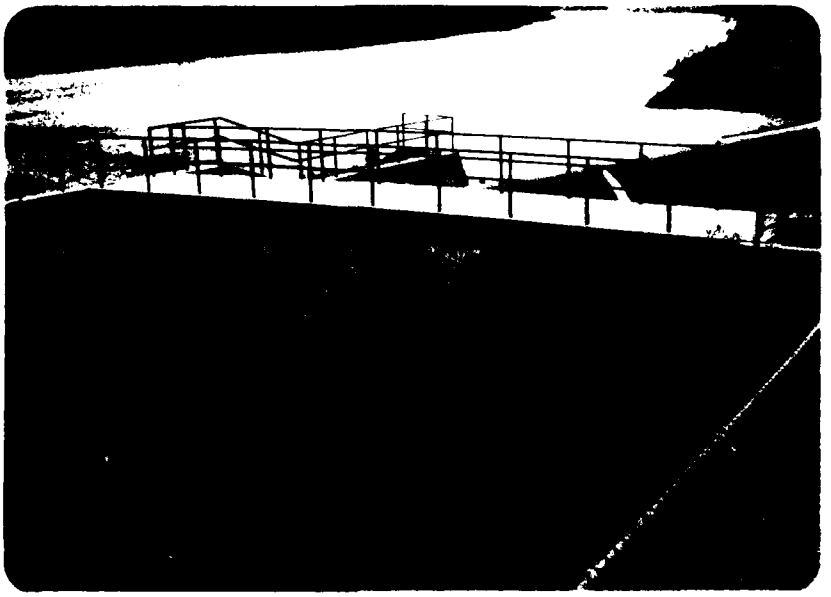
3. Abutment and the South End of Spillway, Showing Patch on Concrete Near Vertical Joint.

4. North End of Spillway.

5. The Upper End of Spillway Chute Cut in Ledge. Debris at North End of Spillway.

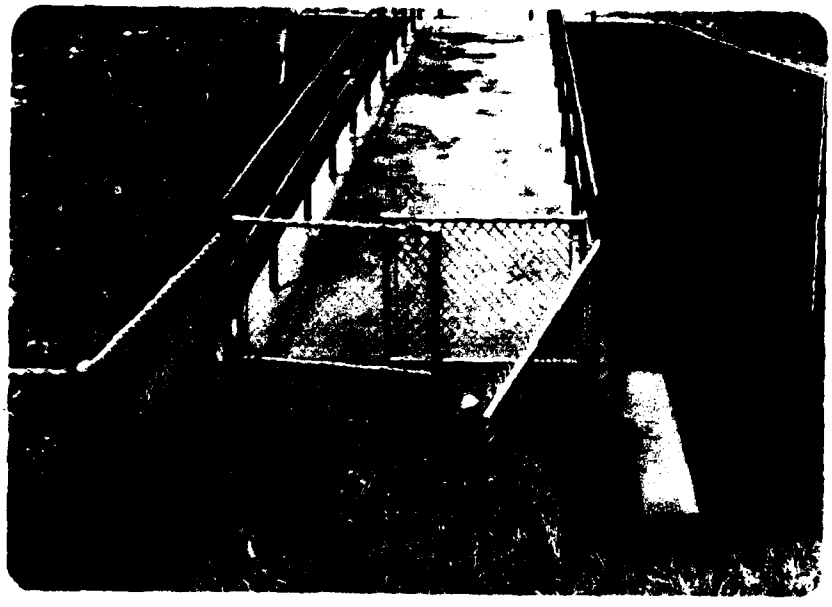


6. Spillway Chute, Looking North



7. Service Bridge, Looking North, Showing West Abutment.

8. East Abutment of Service Bridge.



9. Service Bridge, Looking From the Left Bank.

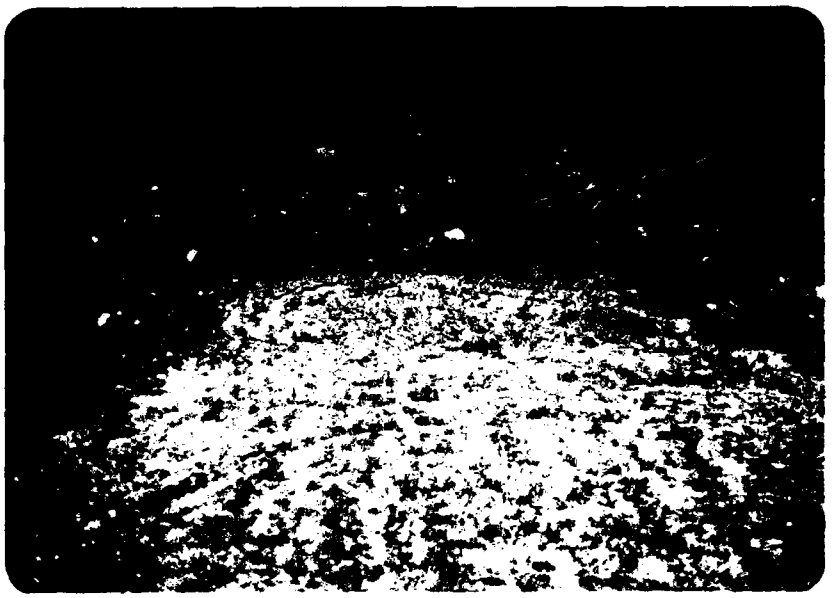
10. End of Embankment and the Slope of the Left Bank, Looking East.

11. Gate House and the Upstream Slope of the Embankment, Looking West.

12. Gate House, Looking East. Spillway [illegible].

13. Gate House, Looking Northeast.

14. Downstream Slope of Embankment, Looking North.



15. Top of Embankment at the Right Bank of the Reservoir.

16. Downstream Slope of Embankment, Looking Southwest.

17. Exposed Layers of Ledge in the Spillway Chute Near the Embankment Downstream Slope.

18. Spillway Chute, Looking Down from the Service Bridge.

APPENDIX D

HYDROLOGIC & HYDRAULIC COMPUTATIONS

FAY, SPOFFORD & THORNDIKE, INC
ENGINEERS
BOSTON

PROJECT EN-606(8)

FILE NUMBER EN-606
SHEET NUMBER 1 of 1
DATE 7-4-72
COMPUTED BY VEM
CHECKED BY

SUBJECT WHITEWATER BROOK DAM NO. 2
SPILLWAY TEST FLOOD INFLOW PEAK

Total drainage area of Whitewater Brook Reservoir at the dam = 4.203 Sq. miles

The drainage area of Whitewater Brook Reservoir is characterized by moderate to steep topography.

Hence, from guide curves furnished by Corps of Engineers, it is found that

Probable Maximum Flood Peak Inflow = 4.203 x 2300
= 9667 cfs

According to the size classification, Whitewater Brook dam is intermediate

According to hazard classification, it falls under the category of high hazard dam.

∴ Spillway Test Flood Peak Inflow = 9667 cfs

FAY, SPOFFORD & THORNDIKE, INC
ENGINEERS
BOSTON

PROJECT EN-006(8)

FILE NUMBER EN-006
SHEET NUMBER 2 OF
DATE 2-2-1972
COMPUTED BY LBM
CHECKED BY

SUBJECT WHITE WATER POND

SPILLWAY TEST FLOOD INFLOW HYDROGRAPH
(BASED ON SCS DIMENSIONLESS UNIT HYDROGRAPH)

Length of travel = 17,200 feet

Difference in elevation = 1160 feet.

$$T_c = \frac{(17200)^{1.15}}{7700 \times (1160)^{0.38}}$$

$$= \frac{74277.57}{7700 \times 14.60}$$

$$= 0.66 \text{ hr.}$$

$$\simeq 1.0 \text{ hr. (say)}$$

SPILLWAY TEST FLOOD PEAK INFLOW
= 9667 cfs

FAY, SPOFFORD & THORNDIKE, INC
ENGINEERS
BOSTON

PROJECT EN-006(8)

FILE NUMBER EN-006
SHEET NUMBER 3 OF
DATE 6-2-1978
COMPUTED BY HRM
CHECKED BY

SUBJECT WHITEWATER BROOK DAM NO. 2
SPILLWAY TEST FLOOD INFLOW HYDROGRAPH
(BASED ON SCS DIMENSIONLESS UNIT HYDROGRAPH)

T_c = 1.0 hr.

Q_p = 9667 cfs.

T (hrs)	T/T_c	Q/Q_p	Q
0.25	0.25	0.05	483.0
0.50	0.50	0.18	1740
0.75	0.75	0.73	7057.0
1.00	1.00	1.00	9667.0
1.25	1.25	0.80	7734.0
1.50	1.50	0.40	3867.0
1.75	1.75	0.25	2417.0
2.00	2.00	0.17	1643.0
2.75	2.75	0.06	580.0
3.50	3.50	0.02	193.0
4.00	4.00	0.01	97.0

FAY, SPOFFORD & THORNDIKE, INC
ENGINEERS
BOSTON

PROJECT EN-006 (8)

FILE NUMBER [illegible]
SHEET NUMBER [illegible]
DATE 6-2-197[illegible]
COMPUTED BY [illegible]
CHECKED BY

SUBJECT WHITEWATER [illegible]
SPILLWAY RATING [illegible]

SPILLWAY Length = 120 feet and crest Elevation = [illegible]

Assume coefficient of discharge for [illegible] -shaped spillway as 4.0 (Refer to DAVIS: Handbook of APPLIED HYDRAULICS) Page 8; Chapt. 20

HEAD	ELEVATION	Q
H_1 = 1.0	968.0	480.0
H_2 = 2.0	969.0	1358.0
H_3 = 3.0	970.0	2494.0
H_4 = 4.0	971.0	3840.0
H_5 = 5.0	972.0	5367.0
H_6 = 6.0	973.0	7055.0
H_7 = 8.0	975.0	10861.0
H_8 = 10.0	977.0	15179.0

NOTE: The capacity curve is taken from project records and included in the report.

FAY, SPOFFORD & THORNDIKE, INC
ENGINEERS
BOSTON

PROJECT EN-006(8)

FILE NUMBER EN-006
SHEET NUMBER 5 OF
DATE 10-11-1978
COMPUTED BY VRM
CHECKED BY

SUBJECT WHITEWATER BROOK DAM NO. 2.
TO DETERMINE PEAK OUTFLOW.

SPILLWAY TEST FLOOD PEAK INFLOW (Q_{P_I}) = 9667 cfs.

TRIAL # 1:

Assume inflow volume = 19" of runoff from D.A

Available surcharge storage upto top of dam

$$= \frac{18.75 \times 8}{4.203 \times 640} \times 12$$

$$= 0.667 \text{ inches of runoff from D.A}$$

$$\frac{\text{Surcharge storage vol.}}{\text{Inflow runoff vol.}} = \frac{0.669}{19}$$

$$= 0.035$$

Returning to Figure 17-11 in SCS NEH, SECTION 4

Corresponding

$$\frac{\text{OUTFLOW PEAK RATE}}{\text{INFLOW Runoff vol.}} = 0.97$$

Outflow peak rate $= 0.97 \times 9667$

$= 9377.0$ cfs. (1)

FAY SPOFFORD & THORNDIKE, INC
ENGINEERS
BOSTON

PROJECT EN-006(8)

FILE NUMBER EN-006
SHEET NUMBER 6 OF
DATE 10-11-1972
COMPUTED BY JJM
CHECKED BY

SUBJECT WHITEWATER BROOK DAM NO. 2.
TO DETERMINE PEAK OUTFLOW.

TRIAL # 2:

From the spillway rating curve, the above outflow peak rate corresponds to ELE. 974.3.

i.e. surcharge height above spillway crest
= 7.3 feet.

$\therefore$ Volume of surcharge $(STOR_1) = \frac{18.75 \times 7.3}{4.203 \times 40} \times 12$

= 0.61 inches of runoff

$\therefore$ Peak outflow $Q_{P_2} = Q_{P_1}\left(1 - \frac{STOR_1}{19}\right)$

$= 9667\left(1 - \frac{0.61}{19}\right)$

$= 9667\,(1 - 0.032)$

$= 9667 \times 0.968$

$= 9358$ cfs. (2)

TRIAL #3:

From the spillway discharge rating curve, the above outflow peak rate corresponds to ELE. 974.26.

FAY, SPOFFORD & THORNDIKE, INC
ENGINEERS
BOSTON

PROJECT EN-006(8)

FILE NUMBER EN-006
SHEET NUMBER 2 OF
DATE 10-11-1978
COMPUTED BY VRM
CHECKED BY

SUBJECT WHITEWATER BROOK DAM NO. 2.
TO DETERMINE PEAK OUTFLOW.

i.e. surcharge height above the spillway crest = 7.26 feet

∴ Vol. of surcharge storage (STOR$_1$)

$$= \frac{18.75 \times 7.26}{4.203 \times 640} \times 12$$

$$= 0.607 \text{ inches of runoff.}$$

∴ Peak outflow $Q_{P_2} = 9667\left(1 - \frac{0.607}{19}\right)$

$$= 9667 \times (1 - 0.0319)$$

$$= 9667 \times 0.9681$$

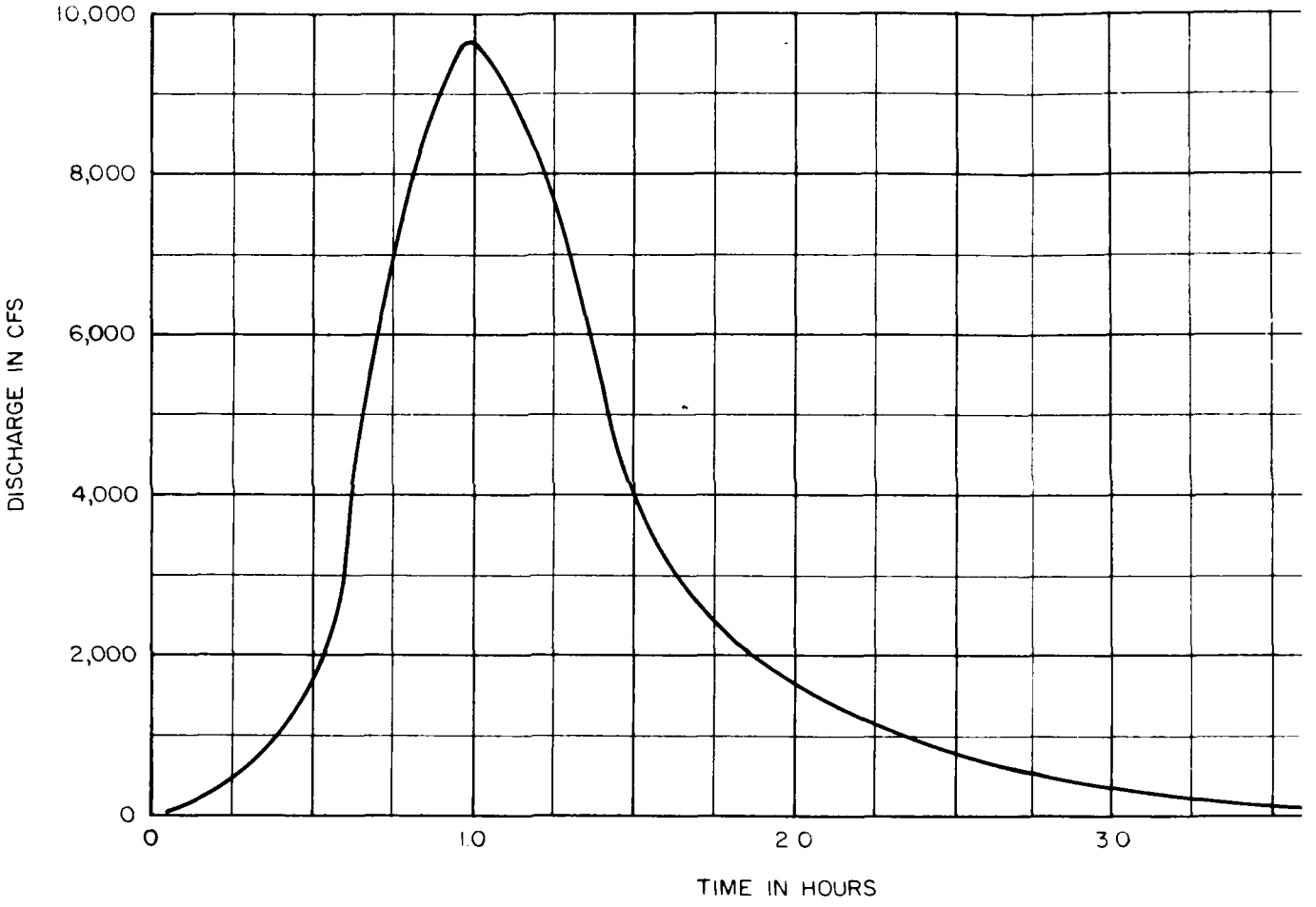
$$= 9358 \text{ cfs.} \qquad (3)$$

Surcharge height above the crest of side-channel spillway

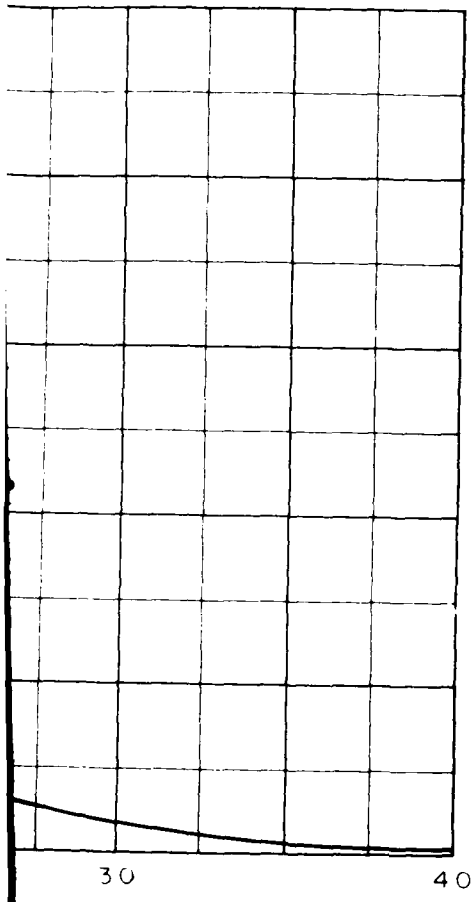
= 7.26 feet.

Max. pool elevation in the reservoir = 974.26 m.s.l.
ELEVATION OF TOP OF DAM = 975.0 m.s.l.
Therefore, the dam is not overtopped due to spillway test flood inflow.

PEAK OUTFLOW = 9358.0 cfs.



SPILLWAY TEST FLOOD INFLOW HYDROGRAPH



GRAPH

FAY, SPOFFORD & THORNDIKE, INC ENGINEERS BOSTON, MASS	U S ARMY ENGINEER DIV NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

WHITEWATER BROOK DAM NO. 2

REDWATER BROOK — NEW HAMPSHIRE

SCALE	AS SHOWN
DATE	AUGUST, 1978

FAY SPOFFORD & THORNDIKE, INC
ENGINEERS
BOSTON

PROJECT EN-006 (8)

FILE NUMBER EN-006
SHEET NUMBER 8
DATE 10-11-1978
COMPUTED BY VBM
CHECKED BY

SUBJECT WHITEWATER BROOK DAM NO. 2.
ESTIMATION OF DEPTH OF FLOODWAVE IN THE VICINITY OF DAMAGE IMPACT AREA DUE TO BREACH IN THE DAM AT RESERVOIR FULL CONDITION.

As explained in Section 1.2 d, it is not possible to generate downstream dam failure hydrograph in the vicinity of the damage impact area, using USGS Quadrangle sheet on which the contours are 20-foot intervals.

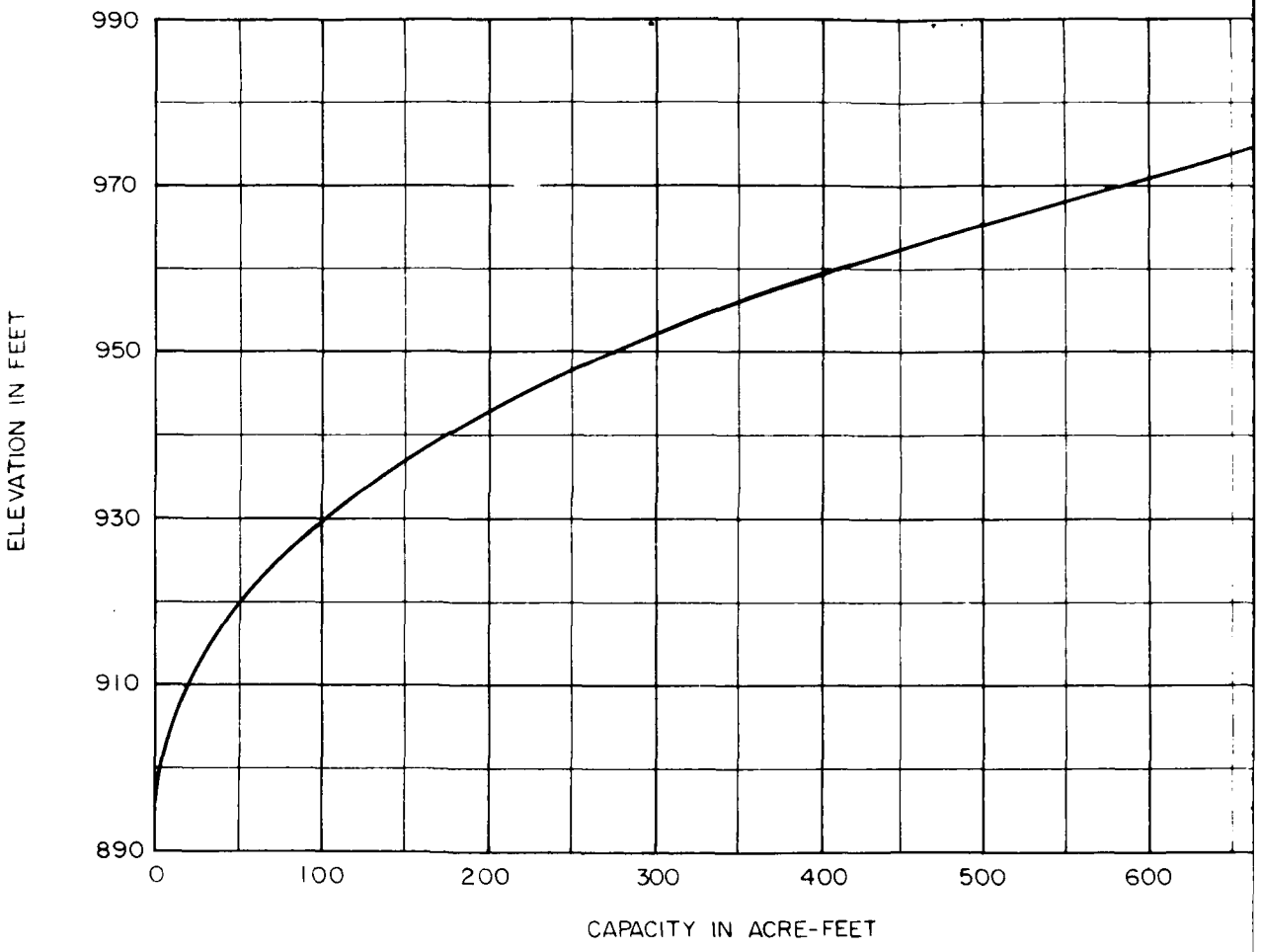
Besides, no other vicinity topographic map is available for the damage impact area which is at a distance of about 4 miles downstream of the dam.

From the knowledge of the damage impact area and the course of the stream, a ball park estimate of the height of the flood wave has been made as follows:

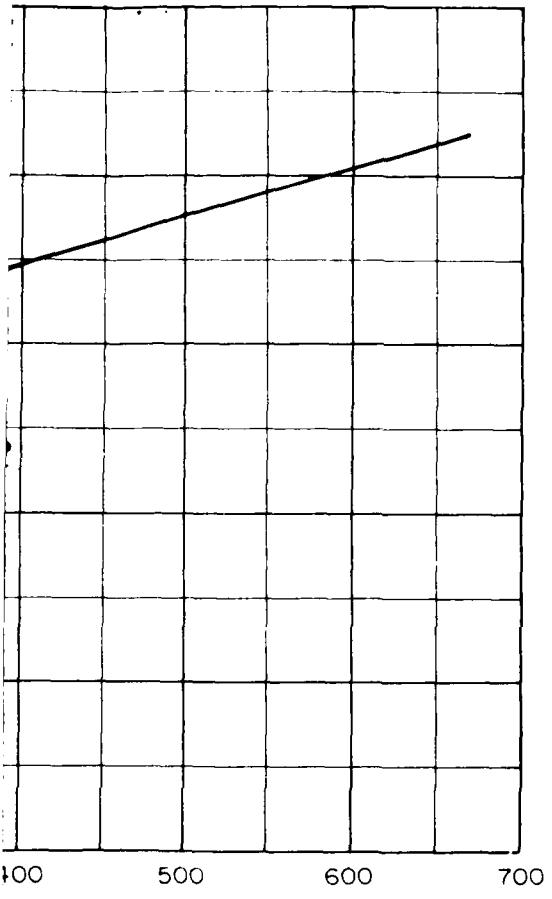
Depth of water above the river bed at F.R.L

$$= 967 - 881$$
$$= 86 \text{ feet.}$$

Height of flood wave at damage impact area is estimated to be about 30 feet. Width of water spread in the vicinity of damage impact area is indicated on the USGS map included in the APPENDIX-D.



STORAGE CAPACITY - ELEVATION CURVE



-FEET

.EVATION CURVE

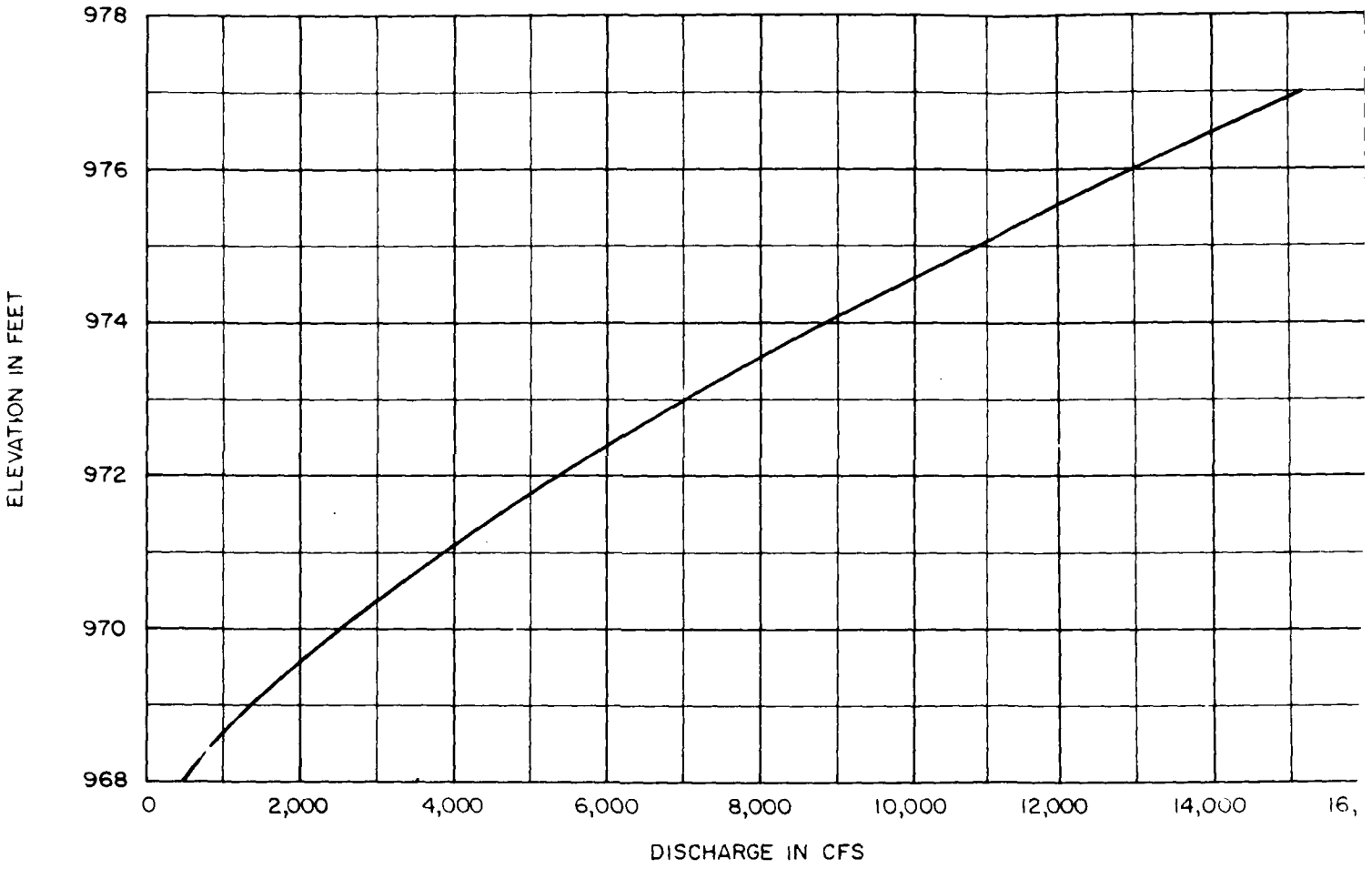
FAY, SPOFFORD & THORNDIKE, INC. ENGINEERS BOSTON, MASS.	U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

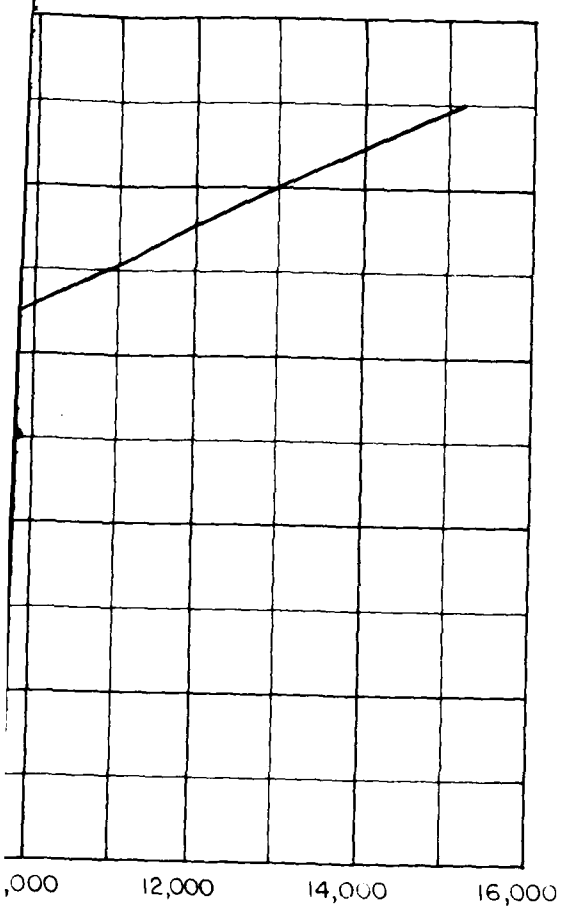
WHITEWATER BROOK DAM NO. 2

REDWATER BROOK — NEW HAMPSHIRE

SCALE	AS SHOWN
DATE	AUGUST, 1978



RATING CURVE FOR SPILLWAY



ILLWAY

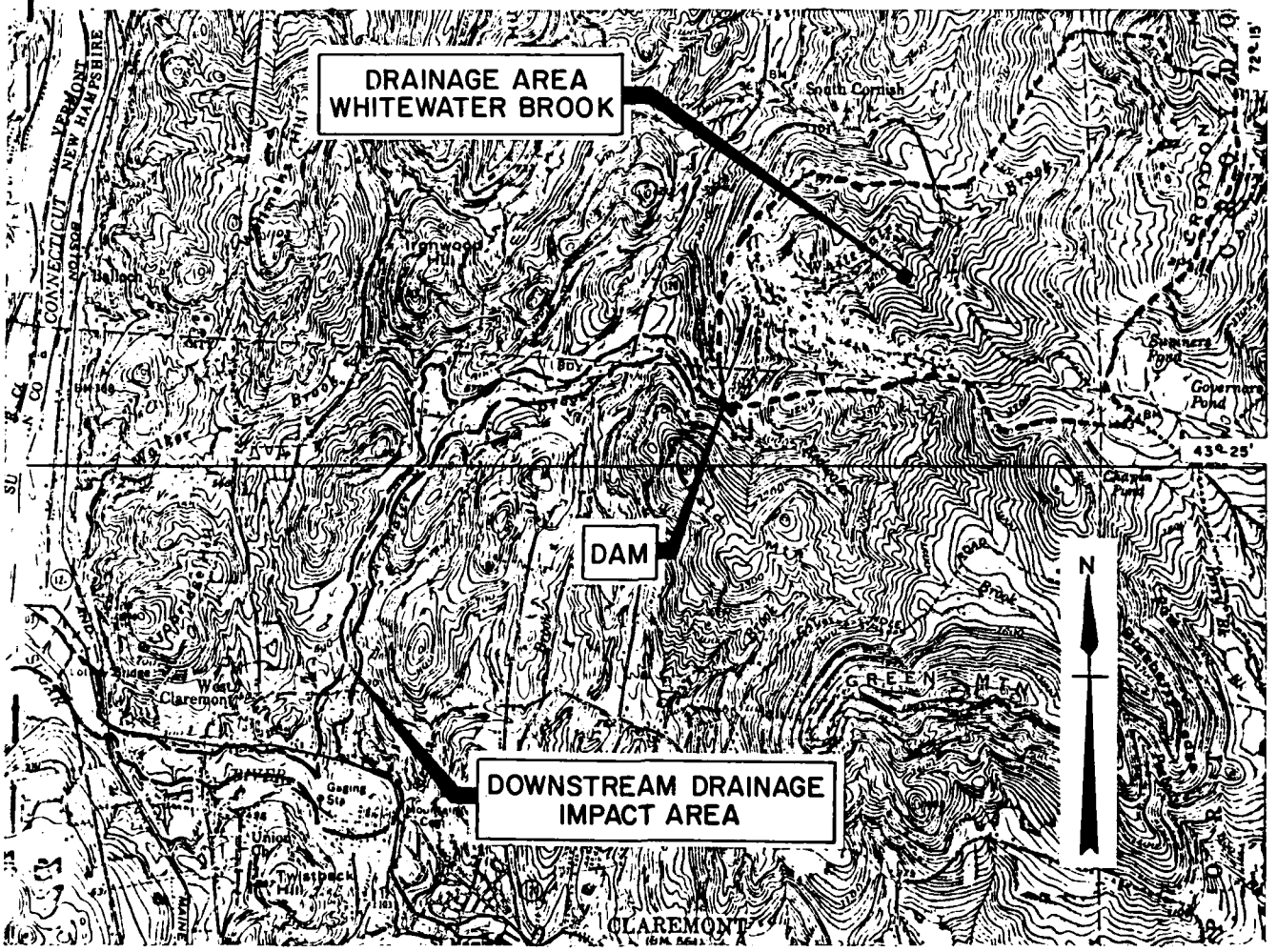
FAY, SPOFFORD & THORNDIKE, INC. ENGINEERS BOSTON, MASS.	U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

WHITEWATER BROOK DAM NO.2

REDWATER BROOK — NEW HAMPSHIRE

SCALE	AS SHOWN
DATE	AUGUST, 1978



SCALE 1:62500 (ACTUAL)

UNITED STATES
DEPARTMENT OF INTERIOR
GEOLOGICAL SURVEY

NEW HAMPSHIRE
CLAREMONT QUADRANGLE 1957
AMS 6570 IV-SERIES V712

APPENDIX E

INFORMATION AS CONTAINED IN THE NATIONAL INVENTORY OF DAMS

INVENTORY OF DAMS IN THE UNITED STATES

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9) NAME	(10) LATITUDE (NORTH)	(11) LONGITUDE (WEST)	(12) REPORT DATE DAY	MO	YR
NH	306	NED	NH	019	02			WHITEWATER BROOK DAM NO 2	4325.8	7210.8	00	AUG	78

(13) POPULAR NAME	(14) NAME OF IMPOUNDMENT
WHITEWATER BROOK LOWER DAM	WHITEWATER RESERVOIR

(15) FLOOD CONTROL	(16) RECREATION	(17) RIVER OR STREAM	(18) NEAREST DOWNSTREAM CITY–TOWN–VILLAGE	(19) DIST FROM DAM (MI.)	(20) POPULATION
01	08	WHITEWATER BROOK	CLAREMONT	1	14000

(21) TYPE OF DAM	(22) YEAR COMPLETED	(23) PURPOSES	(24) STRUCTURAL HEIGHT (FT.)	(25) HYDRAULIC HEIGHT (FT.)	(26) IMPOUNDING CAPACITIES MAXIMUM (ACRE-FT.)	NORMAL (ACRE-FT.)	DIST	OWN	FED R	PRV/FED	SCS A	VER/DATE
RECTG	1968	SC	95	90	665	525	NED	N	N	N	N	11SEP78

(27) REMARKS

(28) DIS TRICT	(29) SPILLWAY CAPACITY	(30) TYPE	(31) WIDTH (FT.)	(32) MAXIMUM DISCHARGE (CFS)	(33) VOLUME OF DAM (CY)	(34) POWER CAPACITY INSTALLED (MW)	PROPOSED (MW)	(35) NAV	(36) NAVIGATION LOCKS LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)
1	425	U	120	3360												

(37) OWNER	(38) ENGINEERING BY	(39) CONSTRUCTION BY
CITY OF CLAREMONT	FENTON G KEYES ASSOC	WARNER BROS INC

(40) REGULATORY AGENCY DESIGN	CONSTRUCTION	OPERATION	MAINTENANCE
NH WATER RES BD	NH WATER RES BD	NH WATER RES BD	NH WATER RES BD

(41) INSPECTION BY	(42) INSPECTION DATE DAY	MO	YR	(43) AUTHORITY FOR INSPECTION
FAY SPOFFORD + THORNDIKE INC	07	JUN	78	PL92-367

(44) REMARKS

END

DATE

FILMED

8-85

DTIC